NATURE MAGAZINE

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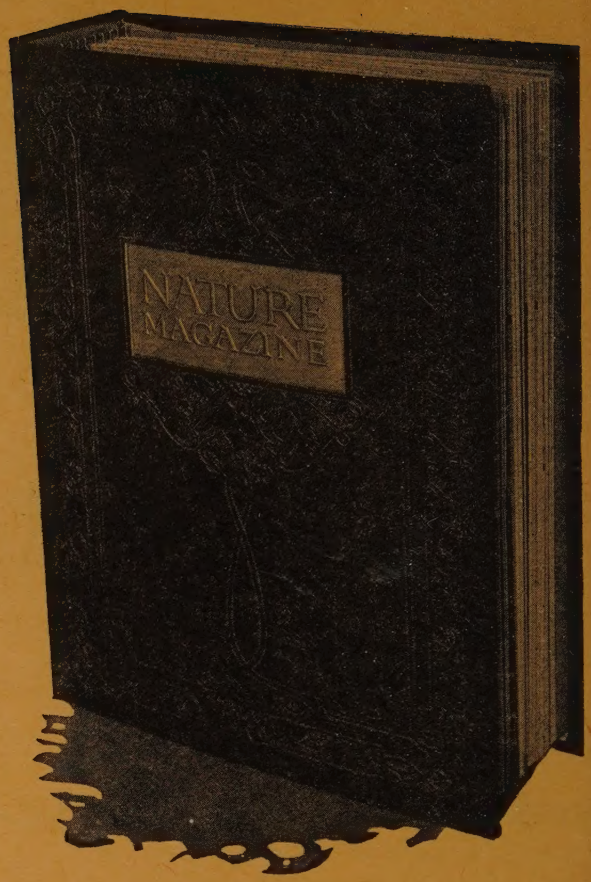

"Where's the latest copy of Nature Magazine?" How often you have heard that question! And how often an answer like this: "Look on the chair . . . over in the corner!" Like as not, the much desired copy will turn up under the cushion in the window seat. And great will be the lament at torn pages and creased pictures.

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Backyard Nature

Mary Larkin Cook of Shadyside Park, Anderson, Indiana, believes that it is not necessary to go very far afield to see much that is interesting in Nature, particularly if one has an observing eye. To support this she cites two observations. One has to do with a squirrel that had been busy in the fall burying hickory nuts in the same part of the yard. Then came the snow, and when it was piled and drifted high this same squirrel came to the very spot in the yard. It dug down through the drift to the spot where the nuts were buried. How did it know, she wonders. Then she tells of a robin pair that started a family in a nest on the down-spout at the corner of the back porch. Something happened to the mother and the father went on the nest and hatched two of the eggs. While he was feeding the young another lone male robin appeared and joined him in feeding the two young. When the first youngster left the nest the father fed it, while the second was cared for by the foster parent.

Birds of Glamour

"Glamour Bird" of the Americas. By Joy Postle and Robert Blackstone. Silver Springs, Florida, 1944. Postle and Blackstone. 40 pages. Illustrated. Fifty cents.

A pair of bird lovers have collaborated to produce this interesting little book. Joy Postle contributed the attractive drawings and poems, while Mr. Blackstone wrote the popular descriptive text for each bird picture. The title of the book is not wholly indicative of its contents, for we can think of many glamorous birds not included. Actually the authors devote themselves to the larger birds—the heron, crane, pelican, ibis and spoonbill. However, they quote part of the title, which, we suppose, is by way of indicating that they are dealing with species which to them have particular glamour. The net result, nevertheless, is a little book that people interested in birds will enjoy fully as much for its informality as for its information.

Smelly Business

A rather plaintive release comes from the offices of the Pennsylvania Game Commission, and in behalf of the occupants of the building where the predatory animal control section is housed. Pennsylvania is one of the states that still sticks by the outmoded bounty system and offers bounties on goshawks and great horned owls. So sportsmen and farmers ship in the specimens complete, as required by law. They arrive in various states of decomposition, smelling to high heaven. Please, pleads the Game Commission, draw the birds, salt them well and pack them with excelsior or newspaper. Why bother, we say. Leave the birds alone.

Of Course You Can't Be There—But—

NO, you can't be there at the dressing station to give him a mother's blessing — a mother's care. All you can do is be thankful that the Army and the Red Cross take such good care of our boys. Yes, and you can see to it that such precious supplies as blood plasma, food and ammunition, and all the thousands of weapons of invasion reach the front in prime condition — ready to do their job.

For every one of the more than 700,000 items shipped to our troops overseas is protected against weather and dirt by paper and paperboard.

That's why your government asks you to save every single scrap of paper in your house and give it to your local paper salvage committee. That's why the government asks you to use less paper — and help the stores where you shop to use less paper. For when you carry your own shopping bag to save the store's paper bags, when you accept your canned and bottled and packaged goods unwrapped, you save that much more paper for the boys at the front and for essential civilian paper use.

Look again at the picture at the top of this page. Etch it on your memory, think of it every time you start to waste paper — any time you start to burn a piece of paper.

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Nature in Print

By HOWARD ZAHNISER

My young son a few days after he entered the first grade in school this fall said to me one morning at breakfast, "When you learn to read you have a whole new world, don't you?" It was no new idea to me, I must confess, yet it came with the freshness that children give even to the familiar, and it was a timely thought, spoken in the midst of some rather purposeful meditations on three books that I had just read. These books were *John Merle Coulter: Missionary in Science,* by Andrew Denny Rodgers III; *Many Happy Days I've Squandered,* by Arthur Loveridge; and *The Incomplete Anglers,* by John D. Robins. Biography, autobiography, and recollections of a notable June vacation, these volumes had indeed been for me excursions into a "world" that but for reading would be almost unknown. Yet but for the boy's interruption of my breakfast cogitations on the values which might be reported for these books it is altogether likely that this one common and distinctive value would have been overseen. I am beginning to think that there are more times than we imagine when children should be heard as well as seen.

It was my thought on reflection, however — although unspoken — that we readers have not so precisely a new world but rather a share in the experiences of many other men and women in the world that we have, and with this privilege the opportunity of wide choices. It is a wide world, and many men had lived and died in it before we ever saw it. Some parts of it, some of its aspects, may be of little interest; many of its inhabitants are likewise of no concern. Only readers can truly know this; only readers can choose and know the significance of their choice.

Those who choose to be interested in the ways wherein scientists have advanced the knowledge of plants and have taught their science to others can well be thankful, for example, to Andrew Denny Rodgers, who through biography is giving readers a share in the history of botany in America. John Merle Coulter is for Mr. Rogers not only a scholarly hero but also a central figure among many botanists and an exemplifier of botany's importance. "Coulter," Rodgers explains, "saw not only the practical values derived from application of principles of pure science, but also the large economies to be realized. Plants enter largely into man's experience. They reveal, said Coulter, fundamental laws of life. Plants demonstrate both individual and mass phenomena. Their study has not only educational values included in scientific training but immense benefits to be gained from disease control, adequate and more efficient food production, useful new crops and vegetables, new medications, enlarged timber uses, conservation resources of the national domain, and uncounted other benefits aesthetic and practical." Through his records of Coulter's career and the careers of many other botanists that he describes in some detail, Mr. Rodgers has written a history of American botany during the last quarter of the nineteenth century and the first quarter of the twentieth. It was Coulter who during this period founded and edited the *Botanical Gazette* and, in addition to his own contributions to the literature of botany, exerted a strong and persisting influence on younger men. Dr. William Crocker said of Coulter after his death in 1928, "We have had and lost our greatest teacher, a great botanist and one of our best friends. The world has had and lost a nearly perfect man and a Christian in the noblest implications of that word." Rodgers' biography substantiates this estimate, without a wealth of personal incidents, without the art of recreating a character, simply through the recording of facts and the opinions of associates. The book would have been greatly improved by the addition of a bibliography, perhaps a chronology, and more thoroughness in indexing; interesting as it is to read, it seems most important as a permanent record not of one man's life but of an entire period in the development of a science.

Having laid down such a volume, it is indeed interesting to take up Arthur Loveridge's autobiography with the appropriately light-hearted but much too disparaging title, *Many Happy Days I've Squandered.* Mr. Loveridge is curator of reptiles and amphibians at the Harvard University Museum of Comparative Zoology. He contributes to scientific periodicals. Someone with appropriate seriousness may some day write of him as a figure in the history of herpetology, but Loveridge has not assembled the material for such a work in this book, and no one laying it aside, I dare say, has even a thought of bibliographies. He himself describes the volume as "tales of the many happy days of a life through whose warp and woof reptiles and animals are inextricably woven." It is a good description, but it must be added that the tales are most engagingly told — sometimes humorously, sometimes excitingly, nearly always informatively. As a boy in Britain, Loveridge had enough experiences with snakes and other creatures to season any autobiography. When he went to Africa as a museum curator in Kenya Colony and then spent four World War I years in the East African Mounted Rifles he increased immensely his opportunities to have other experiences with all kinds of wildlife, and with the insistent help of all those around him he made the most of these opportunities. Later as a game warden in Tanganyika Territory he came face to face with lions. After coming to Harvard, in 1924, he found a copperhead and a rattlesnake south of Boston "basking close to a boulevard along which a steady stream of automobiles was rolling." He seems to have a way of meeting up with wild creatures. It is hardly precise to speak of him as studying anything. He has *experiences,* and as he relates his tales the reader has too. This is one of the most entertaining and along-the-way instructive books that I have read, and it appeals to me as an excellent autobiography. Reading it is indeed sharing otherwise impossible experiences.

John D. Robins might be dismayed to have his tale of a vacation, *The Incomplete Anglers,* considered as autobiography, and then again he might not. As a member of the English Department in the University of Toronto's Victoria College, he undoubtedly is much more "important" than he is in the wilds of Algonquin Provincial Park with a canoe, a companion, fishing gear, and camping equipment, yet as he may some day look back on his life he might actually consider such excursions as more important to him than the months of academic life. "There was," he writes, "a perfect purgation of all emotions in that secluded place, with its invitation to indolent reverie, its all-containing local self-sufficiency, its complete spiritual isolation from the world of men, its strange combining of intense absorption with free contemplation, its quiet de-

Rainbow Over Great Salt Lake

By DOROTHY BROWN THOMPSON

Dead aborigines
Once gazed on hues like these
With fear-tense awe;

While we, grown wise today,
Mark the amazing way
Of optic law;

But, held as by a spell,
Neither has breath to tell
What thing he saw.

light for eye and ear and hand." However this may be, we are indeed fortunate that he came out of the park long enough to write this book at least. It is as perfect a record as one might wish to read of a vacation, nor is it solely a book for fishermen (it is page 87 before any fishing really begins). It is a disarmingly frank and detailed account of the trials and triumphs of two men (neither of whom could swim!) who went canoeing in unpopulated lands of rivers and lakes prepared (and unprepared) to take care of all their needs so long as they could stay. If you like to see moose, deer, beavers, bears, and other wild creatures through vacationers' eyes, if you would like to gather hints on how to canoe and camp, if you need guidance on how to get along with your own deficiencies, read *The Incomplete Anglers*. But don't read it in bed if anyone is trying to sleep near by. You laugh too loud and too often.

John Merle Coulter: Missionary in Science. By Andrew Denny Rodgers III. Princeton, N. J.: Princeton University Press. 1944. 321 pp., with 2 photographs and index. $3.75.

Many Happy Days I've Squandered. By Arthur Loveridge. New York and London: Harper and Brothers. 1944. 278 pp., with 23 photographs on 16 plates, and index. $2.75.

The Incomplete Anglers. By John D. Robins. New York: Duell, Sloan and Pearce. 1944. 229 pp., with end-paper map and 20 drawings by Franklin Carmichael. $3.

Home Garden Fruits

Fruits for the Home Garden. By U. P. Hedrick. New York. 1944. Oxford University Press. 171 pages. Illustrated. $3.00.

In our October issue our Garden Editor, Andrew S. Wing, suggested the pleasure and the harvest to be derived from the backyard orchard. Here is a book that is the main course of a meal in which a brief article could be no more than an appetizer. Written by an outstanding authority on fruits, this book is a complete guide to those fruit plants that may be propagated in the home garden. It covers planning the home fruit-garden, its care, the details of pruning, control of orchard pests. It devotes chapters to apple, pear, peach, plum, cherry, grape, the bush fruits, the bramble fruits, and the strawberry. It is written for the backyard gardener, the small orchardist and for the commercial grower.

Another Ark

Noah's Shoes. By Max Fleischer. Detroit. 1944. S. J. Bloch Publishing Co. 160 pages. $2.25.

In his career as a pioneer among the makers of animated cartoons, Max Fleischer must have done a vast amount of reading of natural history. This seems proved by this little book in which the author tries to occupy the shoes of a modern Noah. He imagines himself charged with constructing an Ark and taking aboard it representatives of all species of birds, mammals and insects, not to mention food for his charges. This problem gives him a chance to skip lightly over the vast field of creatures, to describe some of the most strange and to speculate on how he can get them all together within the hull of his modern Ark. The result is an amusing book with a lot of assorted natural history information presented in a rather helter-skelter but interesting form.

Zoology in Verse

Getting There. By Robert M. Yergason. 89 Van Buren Avenue, West Hartford, Connecticut. 1943. Mrs. A. R. C. Yergason. 40 pages. Illustrated by the Author. $1.00.

The author subtitles this entertaining little book "The Psychomotivatease," which, we confess, we find a little obscure, not being quite certain how to syllable the word. However, what seems to have happened is that Dr. Yergason started with *Vorticella* and wrote verse right up the zoological ladder to man. He drew little pictures to go with each one, and when he was finished he had a little textbook in zoology. The result is something entertaining and truly useful that might helpfully be placed in the hands of every student about to take a course in zoology or biology. With it in hand the student would have a quick and amusing preview of what is to come. Outside the classroom *Getting There* is just good fun and good rhymed reading.

The Arts

The Enjoyment of the Arts. Edited by Max Schoen. New York. 1944. The Philosophical Library. 336 pages. Illustrated. $5.00.

A group of distinguished authorities have joined to produce a symposium designed to show the way to thorough enjoyment and appreciation of painting, sculpture, architecture, industrial design, poetry, drama and theater, the novel, the movies, music, and art criticism. It is an extremely well-written, well-edited and entertaining volume that has a unique purpose and approach and achieves the objective it sets out to accomplish.

Correspond

Wilmer Maness, R.F.D. 1, Hemp, North Carolina, is interested in the study of wild flowers, trees and shrubs and would like to correspond with others in various parts of the country having a similar interest.

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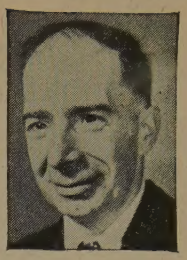

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To Stimulate Public Interest in Every Phase of Nature and the Out-Of-Doors, and Devoted to the Practical Conservation of the Great National Resources of America

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NATURE MAGAZINE is published monthly, October to May, inclusive, bimonthly, June to September, inclusive, by the American Nature Association. Entered as second-class matter May 31, 1927, at the post office at Washington, D. C., U. S. A., and accepted for mailing purposes at the special flat rate of postage provided for in the United States Postal Act of October 3rd, 1917, and February 28th, 1925.

Publication and Editorial Office, 1214 16th Street, N.W., Washington 6, D. C.

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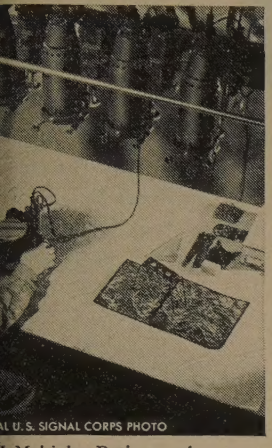

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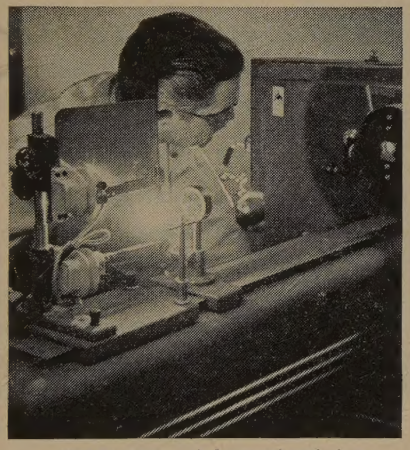

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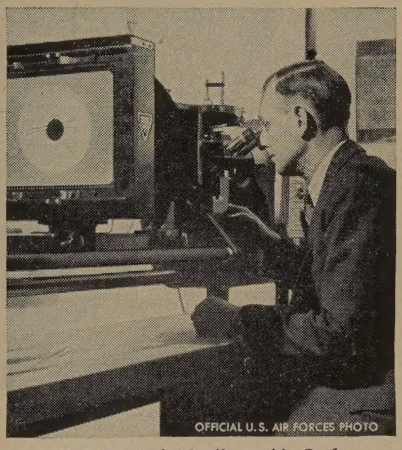

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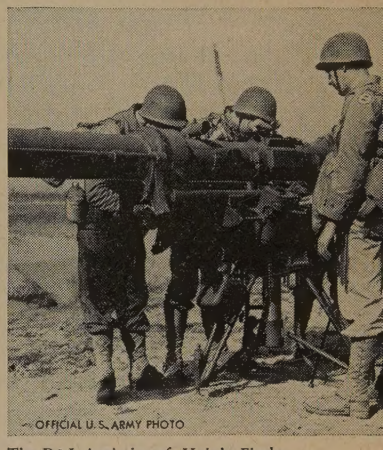

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BELL TELEPHONE SYSTEM

Contents Noted

WHEN they widened Sixteenth Street in front of our office to allow for an underpass, they chopped off some of our front yard and felled the big tulip trees through which migrating warblers flitted every spring, and in one of which we watched a robin family raised and the young launched into swirling traffic. By the curb were planted spindly young elms, to struggle for existence in the hostile environment of asphalt and cement. As though that were not enough, the trees were attacked this year by the elm leaf beetle, and, without benefit of spray, the leaves became brown lacework. Undaunted, the trees sloughed off the brown, dead leaves in early August and put out new ones. By September first they were in full leaf again. It struck us as a lesson in courage; persistence against great odds.

AMONG the unsung and unbemedalled heroes of this war are fourteen soldiers who made a four-day march into typical muskeg country near the Arctic Circle to make a field test of Army anti-mosquito equipment. Equally heroic were two U. S. Department of Agriculture entomologists who accompanied them. Swarming mosquitoes buzzed and bit, and most of the recommended anti-mosquito clothing was not only cumbersome but failed to prevent the insect attacks. While the muskeg mosquitoes could not bite through the sleeping bag, it proved difficult to get air without getting the bloodthirsty buzzers, too. Aerosol bombs, loaded under pressure with freon gas mixed with pyrethrum, proved most effective in a screened pup tent, into which dozens of mosquitoes sneaked when the men crawled in. Small quantities of the gas released inside the tent made sleep possible. These mosquito bombs are all going to the armed forces now, but after the war will be on the market.

A SPECTACULAR union of science, art and patriotism was achieved recently by the employees of Bausch and Lomb through their production of "Dawn's Early Light." Believe it or not, a ballet in four scenes and against a background of narrative and dramatic music, portrayed the origin of light, the evolution of optical principles, the application of these principles to scientific instruments and optical science in the world of tomorrow. Here was something to challenge Agnes de Mille and her fellow ballet creators, and the workers at the Rochester optical company met the challenge to the delight of a total audience of twenty thousand at six performances. The spectacle gained national attention and just might be a tip to Broadway or Hollywood.

TIME was when the dogfish shark, found in Pacific waters from as far south as San Diego to as far north as the Aleutians, was considered a pest by fishermen. It had a nasty habit of tearing holes in their nets and eating their fish. Now that the vitamin industry, with all the aspects of a gold rush, has brought about the over-fishing of the soupfin shark, hitherto yielding its livers to supply nearly half of the Vitamin A supply, the dogfish shark has come out of the doghouse. It is taking over the task of keeping the vitamin boys going. In case you are interested, this shark is a small gray fellow about four feet long and related to the eastern dogfish. Like some other sharks, it produces living young instead of laying eggs. Its new popularity, of course, may prove its undoing.

AN ARTICLE in a recent sportsman's magazine describes the tremendous increase in gunners to be expected after the war. Becoming statistical, the writer points out that 8,500,000 hunting licenses were sold the year before we entered the war. This, we figure, was about six percent of the total population and about twenty percent of the adult male population. Yet the author points out that only two percent of the men now wearing uniform had any pre-service experience with firearms. These are interesting statistics, particularly in view of the hyperbole to which we were treated by hunting magazine writers and advertisers, who early in the war spared no adjectives to prove that the great prowess of our fighting men would be due to their experience as sportsmen. Now, it develops, only two percent of them ever pulled a trigger—and they are doing very well, thank you. In the light of such contradictions, we wonder how much of the editorial crystal-gazing in the columns of the sportsman's magazines will come true, and how much is designed to please the arms and ammunition advertisers and attract larger advertising appropriations?

R. W. W.

A drop of water lapped from a finger with a little red tongue was an after-meal routine with Fannie, until she discovered the drinking cup by the sink and made it her own. Fannie is shown here considerably larger than life-size, as will be seen by the finger size.

Bats

By LEAH BODINE DRAKE

Against a leaf-green twilight sky
The little bats in rapture fly,
Circling in couples or alone
To some still music of their own.

By day each, like a shabby mouse,
Skulks in the crannies of the house,
A timid, frail, and alien thing;
But dusk sees spread each velvet wing
In sudden pride. Their right-of-way
Lies on the edge of dying day.

Then up the clover-scented stairs
Of night they chase the plodding Bears,
Wheel to Antares, and are gone,
To brush the white wings of the Swan,
Swoop where the Dogs relentless roam,
And back to Spica's harvest-home.

No longer cousin to the mole
Within their darkling lands they rule,
Kin to the stars and welcome there—
These dusky princes of the air!

Fannie feeds on a moth. She devoured the body of the insect, the unwanted wings sent drifting to the floor.

Fannie Was A Bat

By RICHARD L. CASSELL

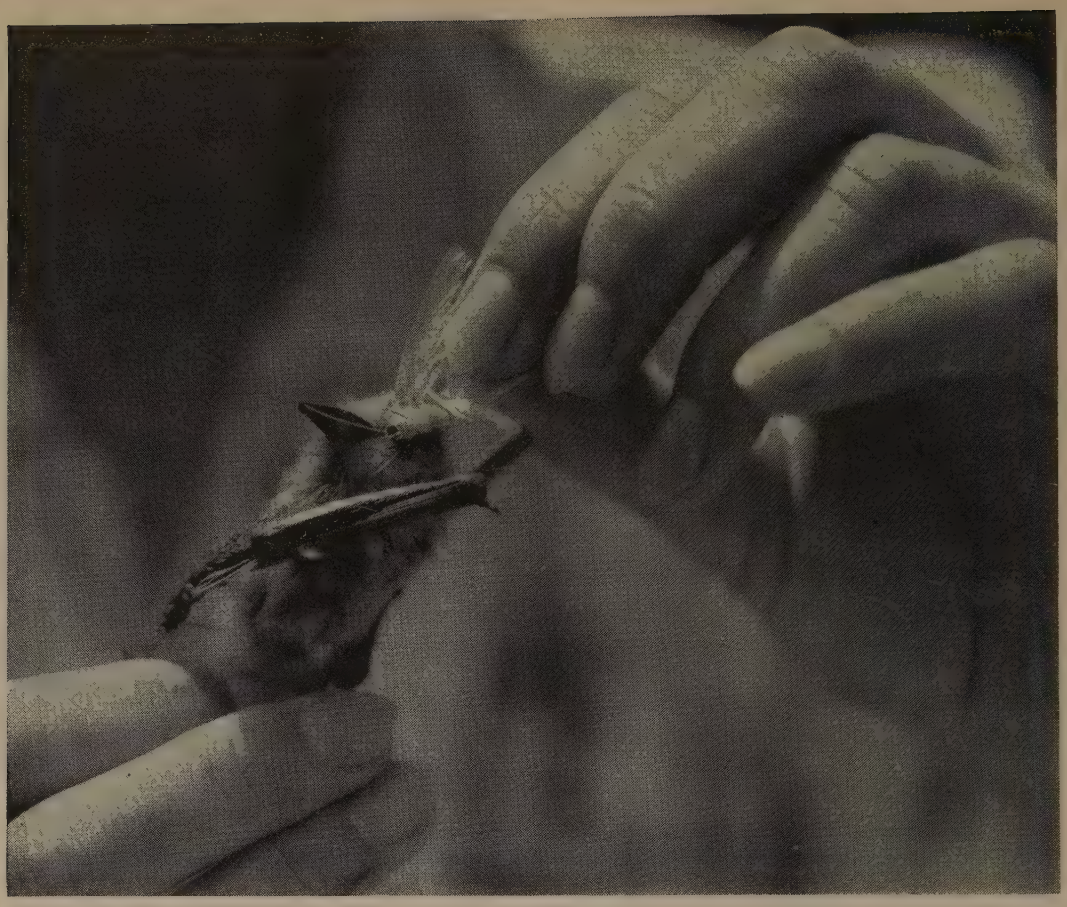
THERE have been tall tales about the bat, handed down through the centuries. Literature has given it a bad reputation, compounded of superstition, fable and fantasy. Yet really to know this eerie individualist is to dispel these old wives' tales.

To those interested in Nature in her many moods there are, of course, certain species of bats of special traits of habit or structure. There are the giant bats of the Old World tropics, fruit eaters, with wing-spreads of three or four feet and bodies the size of a rabbit. There is the true vampire bat, relatively small and an imbiber of blood. There is the fish-eating bat that skims along the surface of water, scooping up the smaller fish as they fly. There are the disc-winged bats of South and Central America, with vacuum discs on the leading edges of their wings. Thus equipped, they can cling, inverted, on a perfectly smooth surface.

And then there was Fannie, a little brown bat of the mountains of northern California, who squeaked with fear and frantically bit my fingers with her tiny teeth as I extracted her from the folds of a landing net. Inadvertently dunked in a fish pond in the process of capture, Fannie was then a bedraggled little beast. Taken home and swathed in a big woolen rag, she snuggled in her blankets in a popcorn popper and slept the night without a chirp.

Next morning Fannie was hanging "by her toe-nails" in her characteristic head-down position, muttering squeakily at my approach. She was completely dry and ran nimbly about in her popper, evading my clumsy attempts to pick her up. How so much wing can be compacted into so little space to form almost a conventional front leg is amazing. Its nearest counterpart is the modern, seat-pack parachute. With the bat, many square inches of vellum are furled and folded along a slender black forearm, at the extremity of which is a "fist" and a projecting thumb. This all serves as neatly as a front leg, and is provided with a single claw. Fannie could run about on the floor, up the curtains, and jump over small obstacles like a cricket.

I finally disengaged her from her cage, and carefully but firmly held her in my hand. To my surprise I was no longer bitten and her struggles soon became half-hearted. She almost complacently allowed me to stroke her head, making only a few remarks. I carried her to the kitchen sink and gently touched a clinging drop of water to her blunt little nose. Evidently some of the water was inhaled for there was a series of minute coughs and sneezes, then she began licking my finger with her tiny red tongue. It is interesting to note that movements of small creatures are usually extremely rapid, similar actions becoming slower as similar animals become physically larger. The miniature wings of the hummingbirds beat, they say, as fast as 10,000 times per minute, while the hovering red-tailed hawk beats ponderously, and every wing stroke can be easily counted by the unaided eye. The heartbeats of a mouse are said to be as rapid as machine-gun fire, while that of the average man is seventy-five to eighty-five per minute. So it was with Fannie's tongue. It was a virtual blood-red blur. I often held her to my ear to try to hear her heart "buzz." At first I thought I could, but later



Within twenty-four hours of her capture Fannie was contentedly feeding from the author's hand. Insects offered to her, however, had to be in action. Dead ones she ignored, and quiet ones held no allure for her.

discovered the audible vibrations to be her respiration frequency.

The evening after Fannie's capture, as shadows deepened and large-bodied moths zoomed, I captured one of these fuzzy tidbits. Holding it by one wing, I was about to buzz it temptingly in Fannie's face, when she utterly unexpectedly charged across her popcorn popper and pounced upon her prey. So eager was her attack that she chewed my finger for the first second or two before realizing her error. She then clasped my finger with feet and "hands," and, with rapidly vibrating jaws, noisily devoured her soft-bodied quarry—all but the wings, which, deftly snipped off, drifted to the floor.

Delighted by this burst of unexpected behavior, all within twenty-four hours, I enthusiastically began to catch moths half of each night. Fannie's final score was fifteen!

For more than two weeks Fannie was fed in this manner. Then, instead of feeding at night during "conventional hours," she was fed at intervals throughout the day. This seemed to be no hardship, and her same appetite and alertness obtained. She seldom attempted to escape from my indifferent grasp, and would even climb about my hand, up my sleeve, around my shoulders. However, I had to pick her up and put her in my hair. She would not go there herself, superstitious belief notwithstanding.

This went on until I feared Fannie might lose her precious mastery of the air. So I purposely left her cage open, and since our summer cottage was small and without too many hiding places she was given the run of the house. Her first aerial attempt was from the diningroom table to a fluttering four-point landing upon my chest. I then deliberately tossed her into the air and she landed on the curtain. Again I picked her up and tossed her higher. This time she responded by circling the room, all but touching the ceiling.

Endlessly she circled. Clockwise and counterclockwise she explored every corner and dropped to low altitudes, nearly touching the floor, but not once did she show the least interest in the large windows through which daylight was streaming. Compare this to a bird's response to such freedom!

After twenty minutes of this, there was a change in "flight pattern." Fannie commenced a kind of power-dive almost to the floor; then an upward zoom to the junction of the wall with the ceiling; then a reverse procedure forth and back from wall to wall. It was just like a swing without ropes. Finally, with an aerobatic achievement very much like a single flat spin on the "up beat," she hooked her tiny claws into a minute crack where the molding was void of paint.

Fannie taking her meal the easy way. The author, however, feared that she would lose her ability to catch her food on the wing, and, indeed, had to put her through a training course to help her regain the habit.

There she spent the remainder of the afternoon.

When feeding time arrived, I brought in a fluttering moth, and, standing on tip-toe, reached high and temptingly waved her dinner back and forth. She was "all ears," cocking them nervously and following my movements with her head, all the while wrinkling her funny little nose. After five minutes of this, and having exhausted a half-dozen moths, which lost their allure with their fluttering, she at last decided to come down rather than starve. Instead of taking off bird-like, there was a preliminary ritual. First she stretched fully each wing separately, then both together. Only after such a procedure did Fannie ever consider a take-off. This time she simply parachuted vertically, landing on my hand.

This sequence of events demonstrated Nature's wisdom. Supposing Fannie had "let go" without this preliminary wing stretching. And supposing some sticky substance, or strong spider silk, had ensnared her forearm or delicately-folded wingtip. It might have been a plunge to her death. Many of our early experimenters with aircraft could have learned a lesson about respect for an inherently dangerous medium—the air. Even this flier, that rivals all birds, cautiously makes sure before the leap into space.

Another noteworthy observation is the head-down attitude. If Fannie had been in an upright stance, hanging by her "thumbs," and had she let go, I doubt if she could have safely missed the floor by the time her head could have been directed downward and flying position attained. This is particularly true of the larger bats. So Nature sees to it that a quick take-off is possible, thus avoiding enemies and shortening the "run." In a split second flying speed is thus gained.

There were many days of hand feeding. Nearly always there would be a live moth or two bottled up in the ice box. Dead moths held no attraction, nor did a live moth not in motion. Many times Fannie has circled my hand in which I held a freshly-caught but quiet moth, but would not seem to sense its presence, even when she alighted within an inch or so from the prey. But if the insect fluttered ever so slightly, she would instantly streak across the room from a far corner and seize her quarry with gluttonous frenzy. Within a minute or two the whole would be devoured, and she would stretch her wings, fairly leap into the air, and resume her fluttering gyrations.

One day a discussion arose as to whether tactical ability of wild creatures is a thing inherent or acquired. This discussion immediately involved Fannie, and we wondered whether a bat's dexterity in catching insects in flight could be halted by hand feeding. If Fannie escaped might she starve, as a caged canary is said to do if liberated? It had been months since

she had foraged for herself for her diet of insects.

That evening a fresh supply of provender was procured as Fannie "paced the floor" expecting to be fed. I liberated a moth as she circled my way. Nothing happened! The large insect gyrated laboriously upward and about and finally collided and vibrated against the light. But still Fannie stoically maintained her flight pattern about the room on silent wings. I let go another moth, then another and another, but no change. She would not be tempted. At length she was fed in her accustomed manner.

I decided to try something different at the next feeding. Allowing a dozen or so moths to flutter all over the house was considered a bit annoying, even to my tolerant household. So I killed a freshly-caught moth, deliberately threw it at Fannie. The first half hour these tosses were ignored completely, but at last Fannie swerved slightly from her gyratory. As attempt after attempt was made, and moths were thrown so close that they all but hit her in the face, she swooped more aggressively. Once she followed her falling prey almost to the floor. Finally moth and bat made contact and the bat ate the moth.

From then on Fannie progressed rapidly. She was only out of practice. Her dexterity grew rapidly. In a week I could throw a moth in the opposite direction, but high enough to give a sufficient time interval, and Fannie would unerringly streak across the room, snap up her prey, and zoom ceilingward. There she would commence her slow fluttering spirals as close to the ceiling as her beating wingtips would permit. At intervals, her smooth circling would be punctuated by an abrupt drop of a few inches as if to grasp a better hold on her victim. A few minutes later moth wings, shorn by sharp teeth and grinding jaws, would come floating downward. Then, in another minute or two, Fannie would lower her altitude to shoulder height—the signal for more.

It was fascinating to watch Fannie use the thin web, which, attached skirt-like to her legs and tail, formed a fan-like continuation of the wings. This web was not only added surface for use in flying, but also acted as a kind of butterfly-net when pursuing her erratic aerial prey. She would sweep within striking distance and at the same instant her body would do a "jacknife," her "skirts" would come into play, and, with an audible thud, her entire body would envelop her quarry in that split second of contact.

May I digress a moment to comment on the widespread belief that bats carry bedbugs. They do not. There is, however, a small parasite, apparently common only to this mammal, that may, with a stretch of the imagination, somewhat resemble the bedbug. When Fannie was first captured she was alive with these "guests," and restlessly scratched, even during fitful slumber.

There was one remedy—fly-spray. So, as Fannie hung scratching in her popcorn popper, I tried her friendship to the breaking point. I saturated her. The label on the can read, "Harmless to warm-blooded animals." This proved no misstatement. The only untoward symptom evidenced was Fannie's jumping about trying to bite and scratch all places at once, while each and every parasite did a last dance in its forest of fur.

Now and then throughout the day, Fannie had always been given water, either from the finger or by means of a medicine dropper. I would selfishly impose on her good nature by awakening her from sound slumber to give her water because I enjoyed feeling her little red tongue vibrate against my finger. Also, it offered an excuse to hold her delicate but powerful furry body in an admiring and affectionate hand-clasp.

One afternoon Fannie was not hanging in her customary place on the window drape. A hurried search by the whole family disclosed no Fannie. Hastening through the house a second time, I passed the kitchen sink. I heard a familiar sound—the faint sneezing that always accompanied Fannie's enthusiastic imbibing of liquid. A drinking cup hung, in rural style, above the sink, and there was Fannie, her "skirts" hanging over the brim of the cup, drinking the few drops of water at the bottom of the cup and sneezing simultaneously. After that, this particular cup became Fannie's sacred property. She visited it at least once every day.

Fannie's nocturnal habits had been modified radically. Between bat-naps she would fly about the house and subsequently be fed. In the evening there would be a "second show," especially when friends came. Then Fannie would never fail to give a star performance in catching food before it hit the floor, or expertly capturing erratic moths as they buzzed about the lights. I think that the ladies of the audience were a bit disappointed in not having a tangled bat-hair tragedy, and that Fannie did not look like a mouse with wings.

Fannie was odorless and as clean as a kitten, washing her "face and hands" immaculately and stretching the thin vellum of her wings and tail with firm grasps of her jaws. To answer to a favorite query: Yes, she was housebroken. Occasionally, one of her admirers would muster the courage to touch her lightly on the back and was delighted to find that nothing happened! Seldom did anyone go so far as to hold her bodily. There was still that inherent repugnance, which I could never understand. And I suppose such people would not like to lie in bed at night, in complete darkness, and feel a waft of air strike one's cheek and hear the muffled beat of her hovering wings only a few inches from one's face, and at times hear the familiar faint, grating chirp that she almost always uttered when coming to the hand for food.

Fannie had the run of the house and access to all the bedrooms, but no one but myself had experienced such nocturnal visitation. (Continued on page 497)

Phosphate Facts

By EDNA H. EVANS

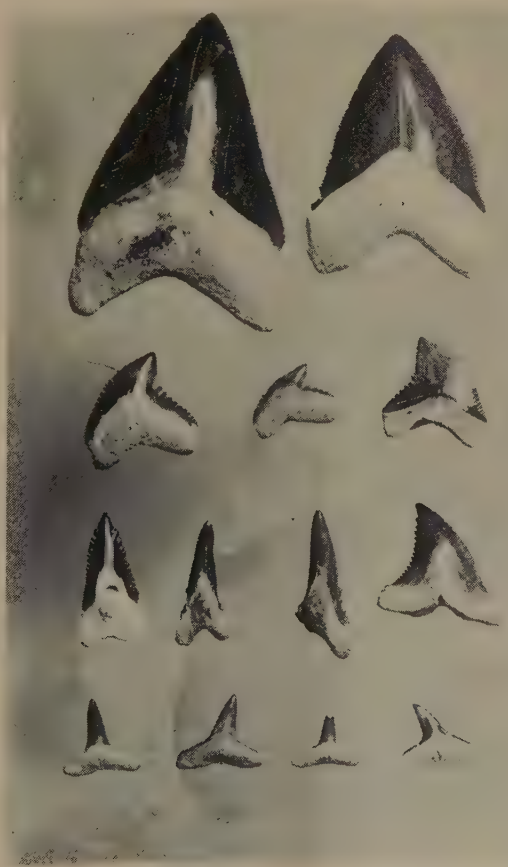
WHEN the nations of the world beat their swords into plowshares, the phosphate industry of the United States will play an important part in transforming the battlefields into land suitable for growing crops.

The phosphate mines and fertilizer plants have been of major importance during the war, also. Because of their products, the United States has been able to raise the food supplies so urgently needed for victory. The bountiful crops of the war years would not have been possible without the fertilizer produced by the phosphate industry.

Phosphate is one of the three essential minerals needed by plant life, and so by all life, since animal life could not exist if there were no plants. The other two essential minerals are potash and nitrates. Each harvest takes a portion of these three materials from the soil, and unless they are returned in some way the soil is soon exhausted and worthless. Nitrates are returned by means of cover crops of the legume family. Phosphate and potash are returned in the form of fertilizer.

Not many people realize that the location of phosphate deposits throughout the world has had an important part in the selection of this war's battlefronts. There are, comparatively speaking, very few phosphate deposits in Europe. However, there are large deposits in Tunisia and Morocco. That is one reason the Germans went into Africa, and is also one of the reasons why the German army fought so bitterly in 1943 to hold that region for the fatherland.

The old method of phosphate mining was wasteful, great streams of water washing away much material. Now it is piled and washed efficiently.



Sharks' teeth recovered from the phosphate pits by the Florida Geological Survey tell some of the story of the past.

In the Pacific, the British-owned island of Nauru, which lies almost on the equator midway between the Marshalls and the Solomons, is an important producer of phosphate rock. Ocean Island, a second British-controlled island lying about two hundred and fifty miles to the southeast, is another important source. Together, these two islands produced a total of 1,263,385 tons of phosphate in 1940. Most of this was shipped to Japan, Australia and New Zealand. Accordingly, Nauru was one of the first of the islands to be taken over by Japan when she started her Pacific sweep.

Russia's chief phosphate field is in the Kola peninsula on the west side of the White Sea. There are other deposits in the region between the Volga and the Dnieper rivers, as well as in western Siberia. On these Russia will depend as she restores her shattered

Monster scoops bite out the phosphate, nine to twelve cubic yards at a time, piling the deposit or taking off the surface layer.

fields to production of foods.

The United States has a generous supply of phosphate deposits. Twelve states have, thus far, yielded phosphate rock in commercial quantities, while eight others have deposits that have not yet been mined. The twelve states are North Carolina, South Carolina, Georgia, Florida, Tennessee, Kentucky, Alabama, Arkansas, Idaho, Montana, Wyoming and Utah. Of these, South Carolina, Florida, Tennessee, Idaho, Montana, Wyoming and Utah have the most important deposits.

Before the war the United States shipped about a million tons of phosphate abroad each year. Wartime has cut down on the phosphate exports and all sent abroad since Pearl Harbor have gone through lend-lease agencies, largely to Great Britain. But in spite of the reduction in our foreign trade, the phosphate output of this country has continued to climb. According to a mineral industry survey by the U. S. Department of the Interior's Bureau of Mines, the United States sold or used 3,799,253 tons of phosphate rock in 1938. In 1942 the total had increased to 4,718,780 tons.

While the major portion of the phosphate rock is used in the production of fertilizer, it is also used in the manufacture of more than two hundred important materials. It goes into such products as baking powder and soft drinks. Compounds derived from phosphate rock enter into the manufacture of washing powders, water softeners, soap, tooth paste and dental cement, metal products and fireproofing materials.

Elemental phosphorus, produced from phosphate rock, has played an important role in the present conflict. In the form of incendiary bombs and smoke screens, it is a vital part of chemical warfare. In peace times elemental phosphorus is used in the manufacture of matches and in the various poisons used to destroy vermin.

Historically speaking, the first phosphate mining in the United States was done in South Carolina in 1867. Production in that state reached its peak of 541,645 tons in 1889, and then gradually fell off until it ceased altogether after 1925, except for an additional hundred tons shipped in 1938. This was because of the increasing competition of the more cheaply mined and higher-grade Florida phosphates.

Florida's phosphate resources were first discovered about 1888 and, after a period resembling the wild days of the pioneer gold rushes, mining settled into steady production. It is estimated that, between 1888 and 1936, the state produced about 79,500,000 tons of cleaned phosphate material.

Today Florida mines lead the nation in the production of phosphate rock, with those of Tennessee ranking second. The western field has not yet been extensively mined and thus most of the nation's supply comes from these two states on the eastern seaboard.

The phosphate deposits in this country are sedimentary in origin. Those in Florida are not of direct organic origin, but are the results of both geologic and chemical changes. There are two types of phosphate deposits in Florida. One type is known as "land pebble" phosphate and the other comes from "hard rock" deposits. Both types began to assume their present form some sixty million years ago, in the late Miocene and early Pliocene ages.

The hard rock deposits were not subjected to marine erosion, as were the land pebble formations. They occur in pockets, and range in size from mere fragments less than an inch in diameter to boulders and masses weighing several tons. Mixed with them are sand, clay, chert and soft phosphate. The Florida hard rock phosphate deposits lie in a belt from five to thirty-five miles wide, extending for some one hundred and fifty miles southeastward from the vicinity of Tallahassee to the northern part of Pasco County.

The land pebble phosphate field lies in a roughly circular area in Polk, Hillsborough and Hardee Counties, and is contained in what is called "Bone Valley gravel," dating from the Pliocene age. It has been subjected to much marine erosion and was probably exposed as marshland and then covered by the ancient sea at several different times.

The phosphate-bearing material, known as the "matrix," ranges in thickness from less than a foot to nearly twenty-five feet. In addition to the phosphate pebble, this matrix contains much clay and sand. The matrix lies at varying depths under the surface, and

the non-phosphate-bearing earth covering the matrix is known as the "overburden." This material accumulated after the phosphate deposits were laid down.

No geologist cares to say definitely just how the phosphate deposits originated. The various deposits in this country differ widely in age, structure and other characteristics. Their ages range from Ordovician—as in the weathered phosphatic limestones of Tennessee—to the late Tertiary and Quaternary deposits of Florida. Their structures vary from the gently-domed deposits of Tennessee and Kentucky to the intensely folded and faulted phosphates of the western states. Their forms range from unconsolidated sands and gravels of South Carolina and Florida to hard, heavy-bedded rock phosphates of Tennessee, Arkansas and the western states.

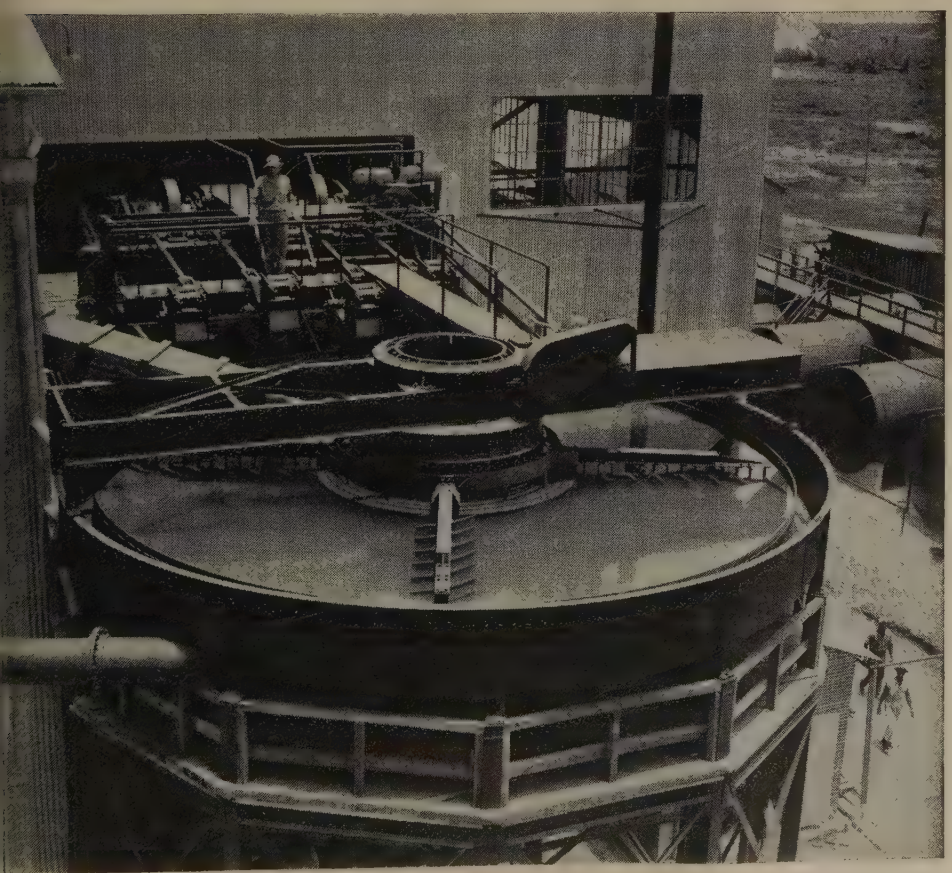
It may seem odd, but the Florida-produced fertilizers that make present day victory gardens grow were laid down in the days when three-toed horses, extinct camels, woolly rhinoceroses and serrate-toothed mastodons roamed over the state. Their bones are often found in the phosphate deposits. And along with the fossil remains of those old land mammals are the teeth of still older sea creatures. Countless sharks' teeth, some of them six inches long and razor-sharp, come from the phosphate pits. The animals that grew those teeth must have been gigantic, so large in fact that a grown man could have stood upright and with room to spare in their open jaws. There are no dinosaur bones, however, for the phosphate deposits date from times more recent than the era of the giant reptiles that elsewhere reveal the story of the past.

The huge sea creatures are not thought to have been contemporaries of the land mammals, even though their remains are found in the same stratum. The marine forms were deposited in a formation called the Hawthorn layer, which underlies the more recent Bone Valley material. Then, owing to marine erosion, the two types of fossils became hopelessly mixed in the phosphate layer.

It is one of the ironies of Nature that, while phosphate is an excellent fertilizer, the land over the phosphate rock deposits is not particularly fertile. One would expect to find lush vegetation and trees as big as the California giant redwoods in this territory, yet phosphate land looks like any other section of Florida flatwoods. There are the same palmetto clumps and the same pine trees that are to be found in many other non-phosphate-producing sections of the state.

The natural phosphate deposits cannot be used directly by plants, otherwise the vegetation would have tapped this great source of plant food long ago. It is not until the phosphate rock has been ground and purified that it is available for fertilizer. A superphosphate, produced by the action of sulfuric acid on the phosphate rock, is much more soluble and is thus even more quickly available to plants as food.

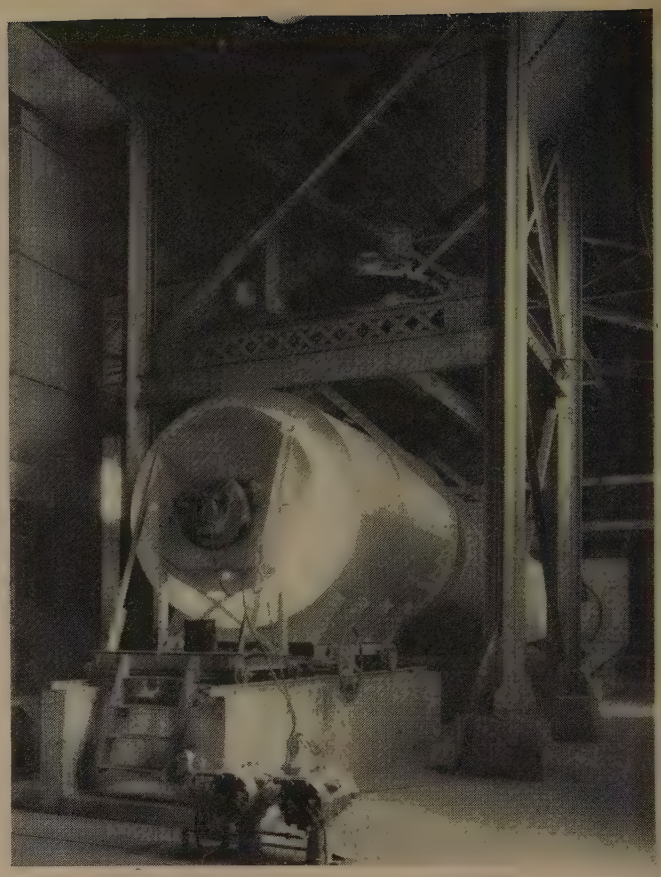
In prospecting for phosphate fields, holes are bored and samples taken to find the depth of the overburden and the thickness of the phosphate-bearing layer, as well as to determine the grade of the deposit. In a soft pebble field, sixteen holes ordinarily suffice in prospecting a forty-acre tract, while in a hard rock field, where the deposits are more erratic in occurrence, thorough prospecting involves boring sixteen holes to the acre.



After a field has been located, the overburden must be removed by means of an electric-powered "drag line." The drag line is a five-hundred-ton machine, having a one-hundred and fifty-foot boom that swings out over the digging. The overburden is scooped up in a huge "bucket," carried to one side and dumped. Buckets now in use have a capacity of from nine to twelve cubic yards. One of the Florida phosphate companies recently ordered a new drag line that will support a

New processes of phosphate recovery through an oil flotation process make it possible to recover about ninety-five per cent of the mineral.

A drying oven where the wet mixture is dried out. Note the reflection from the fire. Ovens beyond the heating chamber revolve and thus mix the phosphate material.



bucket with a twenty-two-cubic-yard capacity—a whole freight car load in one bite. When this is delivered, it will be shipped in forty-two freight cars.

In the land pebble mines being worked today, the overburden is from eight to thirty feet deep, and the matrix from four to eighteen feet thick. Up until about five years ago, hydraulic methods were used in mining the phosphate. Once it had been uncovered, the matrix was broken apart by water power. Hydraulic guns shot powerful streams of water, under intense pressure, against the matrix. The loosened material flowed into ditches and was then pumped to a washer where it was cleaned, screened and graded.

Under the present method, the drag line continues to do the work, scooping up the matrix into piles. The piles are washed down by high pressure hoses and the watery mixture is then sucked into fourteen-inch pipes and pumped to central washing stations. The huge drag lines, working almost continuously, move as much material in one year as was handled during the construction of the entire Panama Canal.

After the phosphate deposit in one pit has been exhausted, the machinery is moved a short distance and a new pit is begun, the overburden from this being dumped into the pit left by the previous mining operation. Thus, a worked-over phosphate field is a series of water-filled pits and eroded earth piles. It is waste land, formerly left to lie idle. Recently, at least one phosphate company has started a reforestation project, planting young pine trees.

At the washer, the wet matrix is churned in what are known as log washers, which separate the phosphate from the clay and sand with which it is mixed. In addition to the logs, various types and arrangements of screens are used to catch and retain the phosphate grains. Formerly, the fine particles of phosphate were lost or discarded in the washing process. But, since 1927, an oil flotation process has been developed that makes the recovery of much more phosphate possible. By means of the flotation process, there is now between ninety-four and ninety-five per cent recovery where formerly only about forty per cent of the phosphate was recovered at the washer.

When the washing process is completed, the "wet mixture" is hauled to the main plant by means of electric-powered railroads. The Florida phosphate industry uses electricity to operate its drag lines, pumps, washers and railroads.

Upon arriving at the plant the phosphate is dumped through chutes on conveyor belts. These belts carry it, at the rate of four hundred tons per hour, into big drying ovens. The ovens are huge, barrel-like containers some sixty feet long. Slowly they revolve, sifting and shaking the phosphate, while a blast of terrifically hot air is blown through the ovens from oil-burning furnaces.

After it is thoroughly dried, the phosphate is ready for grinding, weighing and loading into freight cars for shipment to other plants. Some of the ground material is bagged at the main plant, while other portions are further treated with sulphuric acid to produce a superphosphate that, because it is more soluble, is a much "quicker acting" fertilizer.

Although millions of tons of phosphate rock have been mined in Florida, the supply is still bountiful. This encouraging fact was brought out during hearings held by a Congressional investigating committee at Lakeland in November of 1938. The hearings resulted from fears that, at the current rate of exploitation, the Florida phosphate supply would last only about two hundred years. More thorough investigations led experts to testify that the state's supply would be adequate for more than a thousand years—the total reserve being set at some 26,145,000,000 tons.

The fertilizer industry, as a whole, has a promising future. The longer fields are cultivated, the more materials plants take from the soil. These materials must be returned or yields will drop and the quality of crops will decline.

Phosphate is not the only source of fertilizer, but it does supply one of the three essential materials needed by plant life. Thus, not only in the present war, but also in the peace that will follow, and for many years to come, American farmers will be able to retain the fertility of their fields through the use of materials produced by our phosphate industry.

Swan's Down

As recorded by
PAUL HOSMER

WITH most of her little cygnets hatched, the mother swan rises from her nest to turn over the last two unhatched eggs.

A couple of hours later these two yielded their occupants and the entire family of two parents and eight youngsters immediately went for a swim.

Back from the first adventure on the water one little cygnet was perky and wide awake. His seven brothers and sisters were comfortably parked under mother, but this one little individualist insisted on burrowing up through the feathers.

Soon, however, that strenuous swim on the lake took its toll. He was much more tired than he thought. His eyes drooped sleepily. Suddenly he fell over backward, curled up like a kitten and went to sleep. Yes, one little swan's down.

The Root of the Evil

Meditations of a Naturalist in Wartime

By ALEXANDER F. SKUTCH

A MAJOR factor in the present lamentably disordered state of our planet is the delusion of certain nations that they are, on the basis of race, distinguished above all others by superior natural endowments, and that by virtue of outstanding capacities they are destined to rule and lead the dull remainder of mankind. Since this creed is fostered by scheming demagogues and spread by fanatics, it does little good for serious anthropologists to point out, as of late they have been at pains to do, that their careful measurements fail to reveal a clear superiority of one race over another in either physical or intellectual powers. More than this, some of them freely admit that they are not sure what a race is, using the term to designate the finer degrees of difference among mankind, rather than the three major human stocks.

But the student of human culture and achievements should experience no difficulty in exploding the myth of racial superiority without the aid of the professional anthropologist. Whether he consider the arts, philosophy, pure science or practical inventions, he finds it no easy matter to decide which race or nation has contributed most. The muses have not come down from Parnassus to apply for papers of naturalization in any country with which we are acquainted; the afflatus that bestows genius, wanton as the winds, blows here and there, ignoring national boundaries, color, latitude and social status, in a way no man can explain. There is scarcely any major advance in human thought that has not been forwarded by thinkers in many lands.

But it is useless to waste more ink and paper to prove what is already obvious to nearly everyone of broad culture and unbiased thought. What excites our wonder is that competent scientists should devote so much of their time and energy to the refutation of the calculated lies of unscrupulous politicians, or the even more dangerous fabrications of the pseudo-scientists who make their researches prove what is demanded of them by their employers. Only the exigencies of war will account for it.

It is easy to see the faults of our enemies, but very difficult to detect the same failings in ourselves. We citizens of the United States have been guilty of indulging in much the same sort of vaunting that we so deplore in our adversaries, although without the same nefarious designs. I suppose that most of us heard many times in our schooldays that the United States of America is the greatest country on earth; and since schoolchildren are little given to the analysis of careless generalizations, we took the empty phrase at its face value. A minute's reflection might have convinced us of part at least of its absurdity. Could it mean that the United States was greatest in territorial extent or population? Obviously not, for every fourth-grade pupil knows, or should know, that China, Russia and the British Empire exceed the United States in both population and area. Greatest as a military power? The question has never yet been put to the test—and we hope it will not make any difference after the present disturbance is ended. Greatest in intellectual achievements? A few more years of study would give the young American many reasons to doubt that his new country had yet contributed as much to the intellectual and spiritual treasures of mankind as some of the older nations from which its people have sprung. Wherein, then, does this hypothetical "greatest" lie—and what difference does it make? Can not the child be taught to love and respect his country for its real and substantial achievements, without throwing it into a false perspective in relation to all the rest of the world—a tendency whose dangerous consequences are only too obvious at the present moment? It is not so important whether our country is looked upon as greatest or least among the nations, as that it is wisely governed, gives equal rights to its citizens, and deals justly with its neighbor nations.

AN EARLY contributor to *Nature Magazine*, Dr. Alexander F. Skutch, disappeared from our editorial ken when he went to Central America for banana research. He swept back into our view when *The Scientific Monthly* for April, 1944, published a fascinating and penetrating article by him under the title of "A Parable for Peacemakers." It is an article that deserves a wider reading than the distinguished but limited audience of that publication can afford it.

We discovered that Dr. Skutch, after years of study in Guatemala, Honduras, Peru, Colombia and Ecuador, had acquired a farm in the Valley of El General in Costa Rica. There he farms, studies wildlife and writes. We asked him to contribute again to our pages and this provocating and significant article is his response. It is written from the vantage point of a naturalist sufficiently removed from the swirling currents of the wartime flood-tide to be able to steer a straight and objective philosophical course. We hope, later, for more products of his pen dealing with the wildlife of the regions he now knows so well.

The habit of looking upon our own tribe, race or country as superior to all the remainder of mankind is ancient; perhaps as old as human thought itself. The Children of Israel were not unique in regarding themselves as the chosen of the Lord and set apart from all their neighbors; but their case is the most familiar to us because of the genius of the men who wrote their holy books. To the Romans, as well as the Greeks, most other people were "barbarians," a term that was originally merely descriptive of their unshaven faces, but soon acquired a derogatory connotation. Probably all primitive tribes considered themselves elevated above their neighbors as to origin and worth. They were the sons of the lion and the eagle, while rival clans were sprung from the filth-devouring jackal and the cowardly hare. We laugh at so much savage simplicity—and forget how much of it still lurks in our own hearts. Few of us have learned to view ourselves objectively.

Closely associated with the habit of looking upon our own race as superior to all others is that of considering our species—mankind—as above, and greater than, all other species of animals. These two thoughts have doubtless the same origin in the primitive mind. Man is the highest of all living things, my tribe is the greatest of all the tribes of men, and I—added many a savage warrior, secretly exultant or openly boastful—am the strongest and most valiant of my tribe, therefore I am the first of all created things, the very salt of the earth. Even the great Linnaeus, superb naturalist though he was, was guilty of some of this vainglory when he gave the name Primates—the first—to that order of the Mammalia in which he placed himself, his fellow men, the apes and the monkeys.

For who ever told us that we are first? What disinterested third party, competent to judge, has declared to man that he ranks higher in the cosmic scheme of things than any of the other creatures that share the planet with him? Even the Olympian goddesses, Hera, Athene and Aphrodite, did not feel competent to pass judgment upon their own pulchritude, but left it to an outsider, a mortal who passed as a shepherd, to bestow the golden apple that was the prize of beauty. Yet mankind complacently sits in judgment of itself, and calmly declares itself first among all the myriad species of living things. In what respect are we first? And can we be sure that that quality in which we imagine that we surpass is the most important? I was about to write that it is perfectly obvious that to man belongs the honor, if honor it be, of having caused the greatest and most extensive changes in the appearance of the earth's surface. But has he? A myriad coral islands, great and small, dot the tropic seas. They were built up laboriously through the ages by countless billions of animalcules so small and weak that we crush them by thousands as we walk across the coral reef. Have they not wrought a greater and more lasting transformation in the appearance of our planet than any that we ourselves have performed? They have built while we have largely destroyed. It is not improbable that palm trees will still wave their lordly plumes above the coral-built islands when man and all his works have crumbled to dust, and forests have again reclaimed the many millions of acres over which he has destroyed them—where he has left any soil to support their growth.

The naturalist has wasted his time if his studies fail to teach him humility. Nature adds her voice to that of the greatest of the moral philosophers in bringing home this same lesson. The naturalist's experiences fill his mind with grateful images and sounds; he lives through hours of unforgettable elation as his researches slowly uncover the hidden relationships between organisms and the conditions amid which they exist. *Felix, qui potuit rerum cognoscere causas,* sang Vergil two thousand years ago. We have pushed back the boundaries of our ignorance somewhat since the day of the great Mantuan—only to find that they lengthen as they recede. We have learned the immediate causes of many things; but let us pry a little more deeply, and always we are brought up against the bedrock of our ignorance. We can not claim to have thoroughly studied any process of Nature, to have pushed our researches to their ultimate limit, unless the answer to our final question is "I do not know." Our humility grows with our knowledge.

The incomparably bright tints of a Baltimore oriole glow amid the deep green foliage of my orange tree, making the golden spheres of fruit appear dull by contrast. The nearest point where the wintering bird might nest is some fifteen hundred miles to the northward in a direct line, over forest, mountain and sea. More likely, his summer home is two thousand or more miles away. Unguided, without chart or compass, flying through the darkness of

I Hear November

By COSETTE MIDDLETON

Now let November walk on cold, gray feet
And let the skies be dark with prophecy;
I love the rapid, pulsing code of sleet,
The wind's demonstrative frivolity.
My eyes shall not encompass empty fields
Nor brood upon the ambient shrouds that mold
The dusk of day and year . . . My longing yields
To inner fantasies of flame and gold:
For I have glowing logs and candle-gleam,
A vase with bittersweet, a Chopin theme;
A dog's soft throat upon my foot, and tall
Exotic shadows leaping on the wall.
Yet I must hear November to express
My credence in this warm, bright loveliness.

night, he found his way to this Costa Rican valley. When the sun swings north again he will follow it, unerringly directing his course to the same tree that last year supported the swinging nest of his mate. An aviator, with a panel full of delicate instruments, and detailed charts that others have made for him, might, after long training in celestial navigation, duplicate the feat of the oriole; but no man, relying as the bird does merely upon what he has within himself, could perform such a journey with any probability of reaching his goal. I can write the story of the oriole's life. I can photograph him. I can, if I will, shoot and dissect him. But I can not find my way as he does, and I can not even explain how he does it. Which ranks higher, my ability to do these things, or his gifts of orientation, of song, of leading the free untrammeled life of the treetops, confident in his own resources? Certainly neither I nor any of my species is competent to answer this question. It is not for us to say which ranks higher in the scheme of creation.

As we grow humble, we tend to grow kind and considerate. So long as we hold, as the Psalmist in one of his more arrogant moods, that we have been created but little lower than the angels, and all things have been put under our feet, we shall not care how harshly we trample upon them. But when we see in other living beings faculties that surpass our own, gifts that we can not match, a hundred abilities that excite our wonder and often our envy, while they baffle our efforts to explain, we shall be careful how we oppress them. Our lasting ignorance of the true inner or psychic life of any living creature besides our own individual selves will also make us hesitate to abuse sensibilities that may be far more delicate than we vulgarly suppose. The very ant that struggles through the dust at our feet contains as much to excite our wonder and even our worship as the starry heavens above us. Its microscopic brain has been called the most marvelous bit of organic matter on earth. Remembering this, we shall not wantonly trample the ant, even if at times we must destroy it in self-defense. When we have developed this attitude toward the fellow creatures whose mortal state so much resembles our own with all its toils and perils, we shall not lightly cause them pain or injury, and shall never again look upon their destruction as a pastime.

As our contemplation of Nature leads us toward humility and kindness, we begin to sever the very root of that dangerous attitude of mind that has caused so much suffering and bloodshed upon this planet. As we begin to doubt whether man is the most marvelous, the most gifted and the most important animal in all creation, we are likely to question also whether our own race or tribe is the most noble division of mankind, divinely or otherwise selected to lord it over all the rest. When we feel that it is wrong to destroy any beast or bird for our own transient pleasure, there is hope that we may even attain that degree of sympathy and tolerance that will make us hesitate to injure our fellow men because they speak a different language, or profess another creed, or wear skin of a different color—and that we shall strenuously oppose any political measures that promise to lead toward this result. It may be that the ills that men wantonly inflict upon each other are merely the reflex of those injuries that they have so long and so unfeelingly showered upon all the rest of creation regarded as inferior to mankind.

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Berrying

By PAUL H. OEHSER

[*"Country children know that there are two ways to go berrying."*—Bradford Torrey.]

Beyond the luring railroad tracks,
With their coal-smoky shadow,
Away on past the shanty-shacks
And out across the meadow,

And farther yet, through hedge and fence,
Their barbs all fixed to scratch,
I traveled, and in recompense
I reached the berry patch.

There in the sunlit clearing where
I'd once found pheasant eggs,
I feasted on ambrosial fare
Though briers cut my legs.

But Lord! The berries they were thick,
And some were big as thimbles;
I snatched a dozen at a lick
From off the thorny brambles.

And when upon its nether trail
The sun had started down,
I gathered up my empty pail
And started back to town.

"The male tried several times to approach but she repulsed him, snapping angrily. . . . Half an hour later he timidly crept toward her, but met with the same unrelenting reception."

Hours of watching at the "doorway" of the spider's nest reveals a—

Drama in the Weed Patch

Illustrated by R. Bruce Horsfall

By MARY CHANNELL STEVENS

When I first knew her she was nameless, sexless, strange and terrifying. She was a fleeting shadow in the grass at my feet; a phantom that startled me into knowledge of *something* alive there! Probing carefully for that which had so swiftly aroused my curiosity I found, in the leaf-covered turf, only a hole. Then a big, dark-gray spider popped out of it, only to flash in again.

It was a frightful object with long, hairy legs and extremely ugly face. Its hole, facing south in sandy soil, was about three-quarters of an inch in diameter. The spider spent hours at her "doorway" and I, recumbent, could inspect her at my leisure. This was the beginning of an experience that continued through two years, during which I was privileged to witness all the events of a ground-spider's existence.

She had eight legs, jointed, hairy, and of varying lengths. There were four on each side attached to the front part, or cephalothorax. In addition she had two short palpi near the mouth. These are the instruments of touch and taste.

The eyes were amazing in number, size and arrangement. There were four tiny ones in a row; above those two large ones; higher still, on top of the head but not quite so large, two more. In all they were a group of shining black beads. No wonder whatever was in motion could not escape that multiple vision!

The abdomen was darker, softer and more oval-shaped than the cephalothorax. Scallop markings of light gray through the center edged the darker gray sides. At the posterior end were the tiny spinnerets.

Viewed from the front the spider resembled a walrus. The mandibles, or jaws, one-eighth of an inch long, were edged with rust-colored hairs. The lower ends of the jaws were curved inward like miniature cow-horns. The whole effect was horribly ferocious.

This spider belonged to the genus *Lycosa,* the specific name *nidifex,* which, literally, means that she and her kind live in burrows, or nests, of their own making.

Day after day the little gray spider sat in her front door and nothing happened. Then—the last day of August (she had been discovered in June)—I found another with her. This spider was smaller than she, sand-colored, with scarlet markings. Then I recognied the visitor as a male. But they were far from friendly. I never beheld such fierce, savage anger as that tiny thing expressed. The rusty-haired mandibles worked alternately up and down, the hooked claws almost clashed, and all her eyes fairly glared.

The male tried several times to approach but she

"By the following morning no part of the mother's body was visible. Every bit of her was covered with baby spiders. . . . I estimated there were more than two hundred gathered upon her."

repulsed him, snapping angrily. So he retired to a nearby blackberry leaf and waited. Half an hour later he timidly crept toward her, but met with the same unrelenting reception. Then he gave up in despair. All the afternoon he remained in his hiding place in the grass and refused to go near her again. She recovered from her temper and stood at her door enticingly, but he would not move. Later on he disappeared from the neighborhood.

The next morning, before sunrise, I dashed out to see my pygmy friend. No coy maiden was visible; no lover. However, in due season she emerged to take up her station as usual, steadfast and unhurried. There was arriving the hour toward which all her trivial days had slowly but positively moved—*for the lover returned!*

He came at ten o'clock precisely. I watched him making his way unerringly to his lady love. She sensed his coming and backed into her tunnel shadow, but quickly reappeared, all eight eyes keen and shining. He saw her and turned, but she retired again. What a game she played. The eternal feminine was never more clever.

Finally he reached the entrance and she came out to greet him. Then occurred what is utterly beyond my power to describe. *He sang his love song!* A swift vibration of the body caused a humming sound. He put forth his feelers tentatively. She did not run away but shyly touched his questing feeler with her own. With quick decision she capitulated and the courtship ended in their mating.

A permanent impression was made on me by that love song of the male. Their absorption in each other was so complete that I could get near enough to hear the humming and know that it originated from the vibration of his abdomen. It was unique and astonishing; very delicate and precious. In that hour I entered into an entirely new realm of law and order.

In the afternoon he curled up in a ball near her doorway, looking exactly like a wisp of dry grass. He roused later and ventured in again, humming his song, but was repulsed and came out hastily. The afternoon hours passed while he waited her pleasure. Then he disappeared and thus the curtain fell on that consequential affair.

For a week she lay, a sleepy bunch, just inside the tunnel entrance where the sun shone full upon her. After that seven-day period she began reconnoitering, then began to enlarge her quarters. The virginal burrow in which the young female spider lives is only two or three inches in length. After mating the maternal and home-making instinct manifests itself. Mrs. *Lycosa* worked assiduously at excavating, bringing out, little by little, a large amount of fresh earth, placing it in even piles around the entrance as if for a barricade.

Several weeks of this kind of work led to the next step, which was to plaster the nest-walls with a mud-like material she prepared from a secretion of unknown source. Over this she wove threads of the finest iridescent cobweb. Plasterer and paperhanger, she finished her work and rested from her labors.

By the last of September the busy female had been urged to intense industry. Fresh and larger lots of earth had been inched out and put in tiny heaps. But something else was there! I found what was left of the male, two legs and a part of the cephalothorax, cast out on one of the dumps in his wife's back yard. So she did eat him! What a fate to have befallen the former brisk, natty-looking youth.

The tiny arachnid continued to make her home snug and weatherproof. She even pulled grasses across the entrance and wove them together to form a protective wall against debris or snow, but left a small opening at one side through which she could pass. November first, more than four months since I

"At the tip-end of her abdomen she carried a round, white, marble-like ball. . . . So intent was she on her own job she never showed fear at my nearness."

made her acquaintance, I went away for the winter, never expecting to see my pet again.

June of the following year found me returning to New Hampshire. The home of the spider was my primary interest. Autumn leaves had been tightly packed together by the weight of New England snows. Scraping them away, what should I see but her ladyship backing out of the door. She looked faded and worn out. At the tip-end of her abdomen she carried a round, white, marble-like ball. This elevated the abdomen to an angle of about 33 degrees. Questions of "how," "when," "where" such an appendage came to be remained unanswered. Instead there began a period of watchful waiting. So intent was she on her own job she never showed fear at my nearness. That egg-sac, carried either front or rear, or left in the tunnel at will, was her chief concern.

It was toward the last of July the great event occurred, and I was there to see it. An infinitesimal black dot moved on the outside of the sac and wriggled off; then another, and another, and another. A needle-point opening permitted their exit; then there was a swift run up the maternal legs.

By the following morning no part of the mother's body was visible. Every bit of her was covered with baby spiders. Even her eight eyes were hidden. From her size I estimated there were more than two hundred gathered upon her. Using a magnifying glass I saw the young distinctly. They were one-eighth of an inch long and packed so closely that their thread-like legs seemed like cobwebs holding them in place.

She bore her burden patiently but appeared weary. and the following day exhibited what *seemed* to be intelligence. A dry stiff leaf was held upright to grasses by cobweb material. By adroit maneuvering she succeeded in disposing herself over it in such manner as to rest her weight upon it. She straddled the leaf and let it carry the load. Clever mother!

In a few days she began to send the young off into the world. A shake on one side of her, then the other, and away went the outer layer. They climbed to the top of nearby grass blades, looked around, then swung off to others, leaving a fine silken thread behind them. For two days young ones were shaken off at intervals. She sent dozens away, yet not one remained near her.

As soon as her babies were all in place upon her the mother abandoned the sac, dropping it about six inches from the burrow entrance, where I found it. It was thin as tissue paper but with an elastic quality; one and three-fourths of an inch in circumference, one-half inch in diameter. The outer coat was tough; the inner of soft, kid-like texture. Between the two was a layer of fluffed-up silk. A perfectly constructed shelter against time and weathers in which the young could develop.

When they were all gone desolation reigned. The little mother disappeared at night and the passing hours told me she had gone forever, perhaps to die alone, her work accomplished. Convinced she would not return, we investigated her home. The burrow's opening was one inch in diameter. As far in as eye could see it measured two inches; then a turn to the left downward for six inches; an abrupt turn to the right, and obliquely down four more inches. In a vertical line from top soil to burrow-end it measured nine inches, but the devious turns made a total of more than twenty inches that little spider had cleared out. There was no large chamber. The entire tunnel was of uniform size—and empty. Mrs. *Lycosa* had fulfilled her destiny. Even more, she had unconsciously taught a human being some of life's secrets.

The Prism

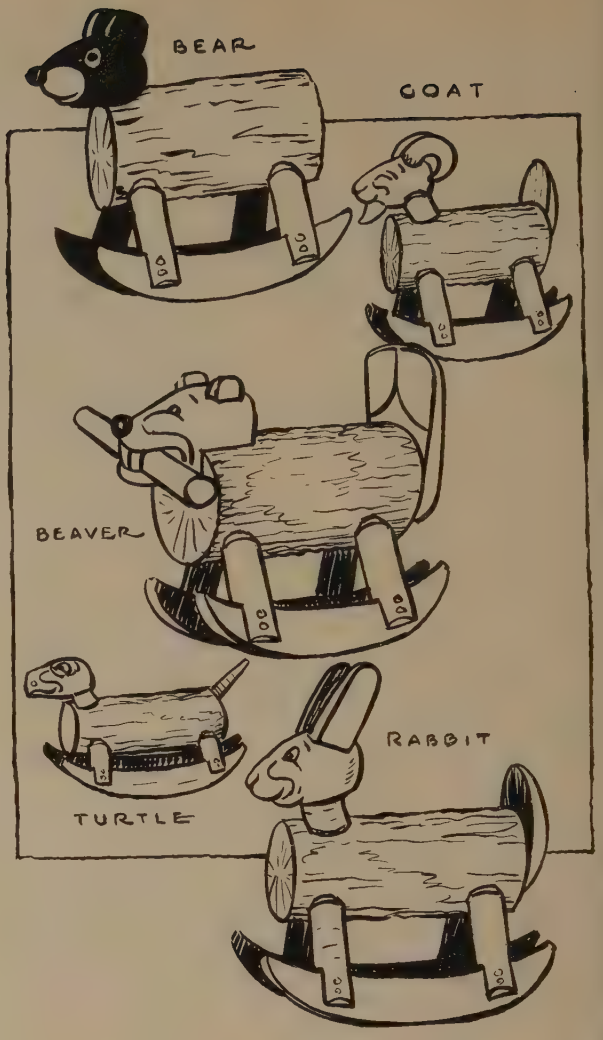
By CAROLINE WADSWORTH TURNER

Peripheries of color hide
In the white light of the prism,
Like butterflies in a chrysalis
They lie implicit

Rocking Animals

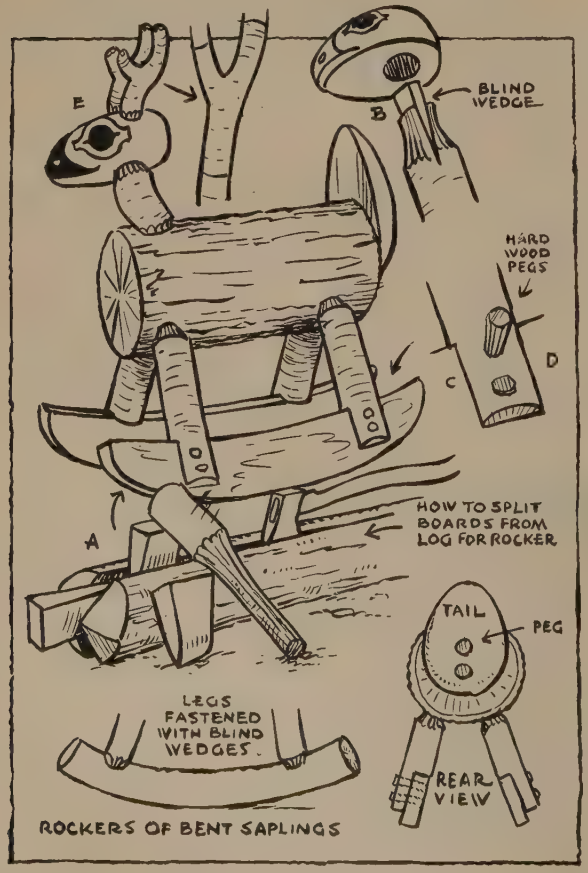
Another Nature-Craft Article

By ELLSWORTH JAEGER



WHEN Christmas came to the backwoods, Santa Claus had no toy shops or toy makers to help him fill his bountiful gift sack. However, gifts to the children in pioneer cabins were often more treasured than were the more beautiful toys of the city.

The old frontier is gone, but we can still make backwoods toys, for today there is even a greater need to make things with our hands from materials we have at hand than ever before. Boy and Girl Scout and Camp Fire Girl groups, camps, schools, community centers, churches and other recreational groups are constantly looking for craft ideas. While the making of things in itself is an excellent pursuit, this activity, when inter-related with another, makes it doubly valuable. The making of backwoods rocking animals offers such a combination. It creates a hike objective to gather raw material; it offers an opportunity for Nature study in tree identification and uses, as well as a study of various animals, adapting their form to fit the materials used; it gives an opportunity to develop craft skills in the use of fundamental tools such as the axe, knife, auger and saw. This project also involves such carpentry tricks as the blind wedge, the use of pegs instead of nails, and mortising.



The raw materials can be collected easily. The bodies of the animals are made of small logs, and the legs and necks from branches and second-growth saplings. The rockers are made from bent branches, or from boards roughly hewn from split logs.

In splitting a log, start it with an axe, and then drive in hard wood wedges with a maul as shown (A). Work back with the axe, enlarging the crack by driving in wedges until the board splits off. Trees that split straight are pine, spruce, cedar, ash, oak, poplar and chestnut.

Use only seasoned wood in making the rocking animals. Green wood shrinks and will check. Thus it will be necessary to gather your wood some time before it is to be used. The size of the rocking animals is up to the crafts worker. Since it is made for a smaller child, however, the measurements should conform to the size of the youngster. If the bark is left on, it should be scraped smooth to remove the coarse parts.

In anchoring the legs, neck and other parts a blind wedge is used. That is, a leg is split a little and a hardwood wedge inserted (B). Both are then driven into the hole made with an auger. The farther the leg is driven into the opening, (Continued on page 498)

Aye, She *Was* Bonnie

By H. R. IVOR

Photographs by Hugh M. Halliday

This is a sequel—or a complement—to the article, "An Avian Creche", which appeared in the August-September issue. It rounds out a remarkable bird story.

Bonnie, as a young bird, feeds from the author's hand. Below two of Josie's young, which Bonnie helped to feed.

Deep down in the dark of a nest box, Josie, the mother bluebird, sat patiently day after day. Five light blue eggs were warm beneath her. She slept at her task, and, sleeping, dreamed the hours away—if birds dream. When the cover of the box was lifted, two or three twittering notes were heard, muffled by the soft blue feathers, into which the mother's head was tucked. Soon she would have no time for daylight sleep.

The bluebird nest box was in my winter aviary, which, with a summer aviary and a wild bird sanctuary, make up my bird haven near Toronto, Canada. Some may wonder why our native birds are kept in an aviary, even in a state of semi-captivity. The reason is that there are many gaps in our knowledge of the life histories of birds, of the facts of bird personality. To learn better how we may protect and increase our population of birds, a few nestlings each year are raised by hand and their habits and individualities kept under observation. This is a revealing experience, and in no case more so than with one of the nestlings that came from this bluebird nest box in the garden. She came to be called Bonnie, for aye, she was a bonnie bluebird.

When Bonnie came to be reared by me as a foster parent she was eight days old. She was a shy baby, and at first refused to open her beautiful, orange-lined mouth for offered food. Holding her cupped gently in one hand, I waved the food stick—a partly hollowed elderberry cane filled with food—before her eyes. Slowly the little bill opened; then wider and wider. A morsel of food was placed deep in her throat. Her shyness must have been swallowed with that food, so quickly did it disappear.

Soon Bonnie was no longer content to remain in the nest that had been made for her. Exercise was

The summer aviary maintained by Mr. Ivor to study the life histories, habits and relationships of birds. Besides this outdoor aviary there is a winter one. Also the surrounding trees and shrubs afford nesting places for many species of wild birds. There they find complete sanctuary.

strengthening the baby wings and legs. A fly on the window pane drew her eyes; the meaning of movement dawned. The wings were tried. The fly was missed, but the nest was no longer home.

Each day the nestling became more lovable. Once, well fed, she hopped into my hand, crouched down in the palm and went to sleep. Aye, Bonnie, indeed!

She was about six weeks old when the nestling wood thrushes, veeries, bobolinks, orioles, cardinals and a cowbird were adopted—fifteen in all. They were placed in the aviary for hand-rearing, and Baby Bonnie, by now learning to feed herself, joined them there.

Then a strange thing happened. Bonnie accepted an offering in the food-stick, but, instead of swallowing it herself, hopped down to a baby near her and gave it the food. From that moment she and Vee, an old unmated wood thrush—with some help from me—fed and reared the fifteen youngsters. It was a three-week task for the three of us.

Not long after the fifteen little ones were independent, five more nestlings hatched in the nest-box where Josie had been keeping her vigil. Shortly after they were born, Bonnie found them. Here were more babies to feed. Thus began one of the most touching episodes in bird life of which I know or have seen. Josie had just left the nest. Bonnie, curious and interested, flew to the entrance. She poked her head in two or three times, then entered the box. Immediately she came out and flew directly to the food cup filled with nestling food, and on which Josie was standing. Both picked out a billful of food and flew to the nest-box. Josie, a wing-beat ahead, seemed to melt into the entrance in her haste to feed the little family. Bonnie clung to the entrance, looking in. Josie stayed,

Vee, the wood thrush, and Josie, the mother bluebird, who was aided by Bonnie in feeding her young. Vee is the bird described in the August-September issue of *Nature Magazine*. With Bonnie, and some help from the author, she raised a varied group of young birds in the winter aviary at Mr. Ivor's bird haven.

A friendly bluejay that Mr. Ivor called Unu, just why we do not know. Many species of birds are guests at his sanctuary, a few being hand-reared in the aviary each year to provide data not otherwise obtainable. During the winter the author maintains a feeding station for those birds that spend the season in the North.

warming the little ones. This seemed to puzzle Bonnie. Seeing no open bills, she flew to a branch, then instantly back. Not a sound came from inside the nest-box, yet she knew there were babies there and they *must* be hungry. Several times she left and returned. Finally she swallowed the food herself.

Alert, Bonnie watched and waited. The moment Josie's head appeared in the entrance hole Bonnie darted to the food jar, then to the nest-box and down into the dark interior. While she was there Josie also flew to the entrance hole with food and clung, waiting until her self-appointed helper came out. Joey, the bluebird father, then visited the entrance while Bonnie was on top of the box. Twittering greetings were exchanged, but there was no sign of unfriendliness on the part of either parent. This lovable young bluebird was accepted as a partner—an extra bird mother.

When I visited the aviary a little later I could see neither Josie nor Bonnie. Gently lifting the lid of the nest-box, I peeked in. There, sitting side by side, brooding the five tiny young, were both Josie and Bonnie. They looked up into my face. For an unforgettable moment I watched them, then gently lowered the lid.

The nestling food supplied did not seem entirely suitable for the newly-hatched chicks. If they were to live and grow they must have natural food, so the bird house was placed outdoors and the parents shown where it was. After examining the new home-site and checking on the nestlings, they immediately flew to the garden and began to hunt for the insect life so necessary to rear their brood.

Bonnie could see the nest-box from where she was in the aviary and kept flying to the wire on the door

Vee, the wood thrush, considers an offering of food by Mr. Ivor. An old and unmated bird, she was a foster parent to other thrushes, veeries, bobolinks, orioles, cardinals and a cowbird. Her performance in this respect provided a remarkable and interesting example of the mother instinct at work. Bonnie was her partner.

that separated it from her. Should I let her out to continue to help? If I did would she be sufficiently interested to remain and help? Bonnie coaxed so hard that I had to open the door. At once she flew to the nest-box, looked in at the babies and was off to help with the feeding. She was happy.

Shortly after noon of this first day, as I was watching these care-free three, Bonnie's own brothers and sisters, who had been hatched in the garden bird house, came flying over the aviary. She had not forgotten them, for she called, and, calling, joined them. Many times during the next few weeks, when bluebirds flew over, I called, "Bonnie, Bonnie." In her weeks with me she had learned her name well. But the call of the wild was too strong. Bonnie never came back. Or did she—?

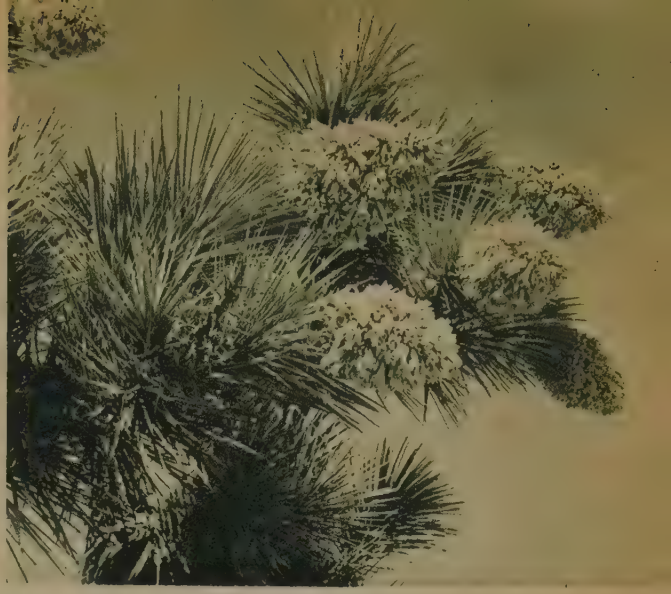
On March sixth, almost two years afterwards, a near-blizzard was raging. On a sheltered winter feeding station, some few feet away from my window, was a female bluebird. Why had she come in the storm, and alone? From time to time for two days I watched this little bird as she fed on the sumach berries and sought shelter in the feeder from the driving storm and cold. Nearly a foot of snow lay on the ground; the temperature was below zero. In my mind was always the question, "Will she come through if this continues?" or, "How can I help her to get sufficient food?"

I picked out a dozen mealworms from the breeding-box and quietly approached her, calling, "Bonnie, Bonnie", using, instinctively, a name not mentioned for nearly two years. I threw a mealworm on the snow. Without hesitation she flew down and picked it up. One at a time I threw the others and she feasted, coming to within a few feet of me. Could this be Bonnie home after two long years? No bluebirds had reared young in our garden bird house last year. Why had this little bird, a female, remained here so long? It is the habit of female birds to seek the territory of the males.

As there was no let-up in the cold and storm, I decided that the weather was not going to take to itself this welcome little visitor. The bottom was taken off a small cage, and a dish with a number of mealworms in it was placed under the cage. Then the cage was held slightly off the snow. At once the bird flew to it and went under. Gently the cage was lowered and the bottom slipped beneath. Quietly the little lady was carried to the winter aviary and released.

Strange as it may seem, she seemed to be at home. She showed no fear of the food cups, nor of the bathing dish, nor of the other birds. Certainly she would not have accepted them so readily had she never seen them before. Later, after great hesitation, she came to my hand for her favorite food. Could this be Bonnie home again?

Sonnie, one of Josie's youngsters, joins four cedar waxwings in a handout. The waxwing at the right seems to be taking a quizzically critical view of the proceedings.



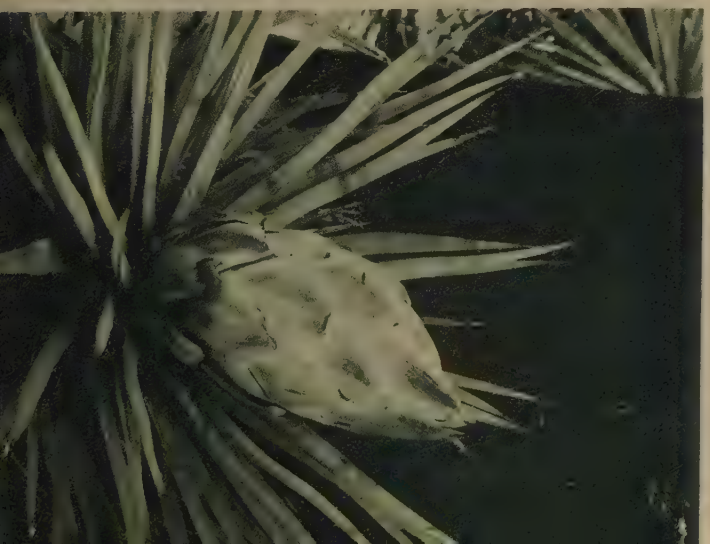
Above is a typical Joshua tree with its beautiful waxy blossoms and, right, a close view of a flower-laden branch. At right is one of the flowers. Below we see a bud still tightly-closed, and another that has already unfolded enough to show the promise of blossoming beauty to come.

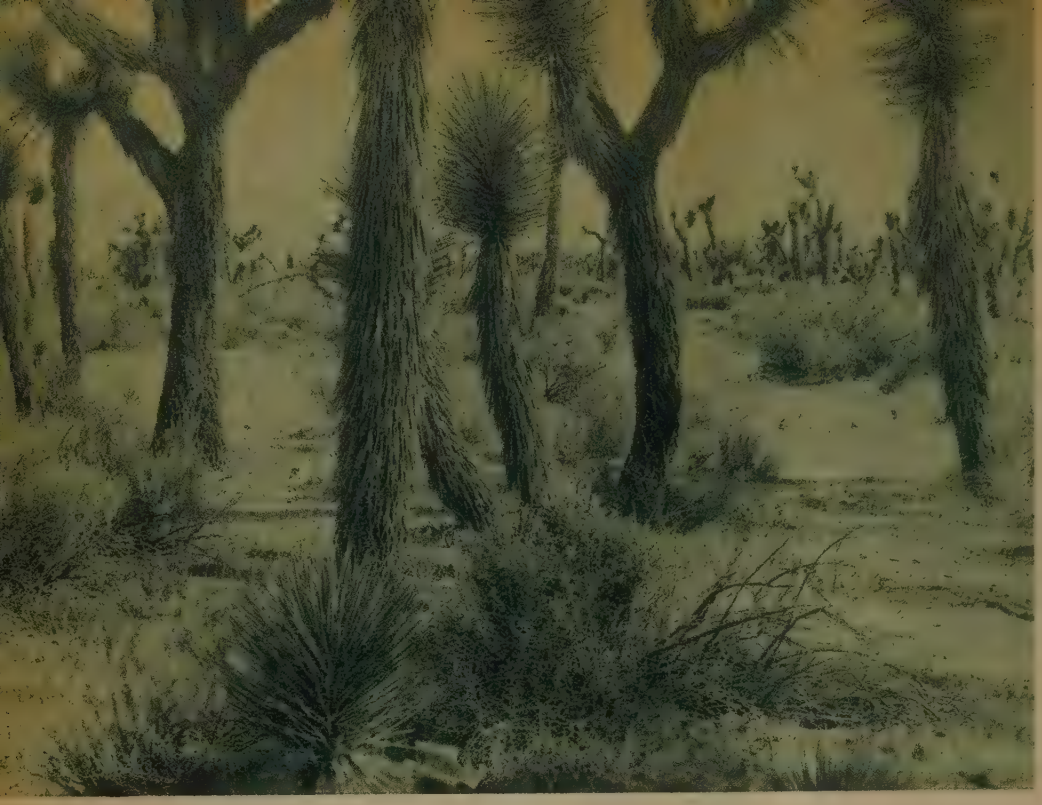
Joshua Trees

By HOMER L. SCHANTZ

The Joshua tree is a lily grown to the proportions of a tree. This it accomplishes not in the warm and damp tropics but on the desert's edge where life is limited by excessive heat, aridity, and frosts. This lily, a tree yucca, excels in size the other yucca species, and, also, most of the lily family if we except the tropical *Dracaena* or dragon tree.

Not only is it distinctive because of size but it is grotesque in form, and should be grouped in interest with other grotesque forms such as the great dragon tree of the tropics, the giant umbellifers of Kamchatka, the candelabra-like euphorbias of South and East Africa, the saguaro of Arizona and Mexico, the idrias of the California gulf region, the grass-gum trees of Australia, and the boababs of Africa.





Joshua trees frequently are found within their limited range growing in sufficient numbers to be called a forest, as at the left. No two are alike and their variety of form is one of their fascinations. Below are two Joshua trees, one contorted in the manner of its kind, drawing its meager sustenance from the desert soil, the other showing how differently it grows in irrigated soil.

The Joshua tree is *Yucca brevifolia*, so named in 1871 by Engelmann. It was known as a tree yucca, a cabbage tree, and, more recently, as the Joshua tree. The origin of this last popular name is not established, but is supposed to have been first used by the Mormon pioneers. This plant is limited narrowly in its distribution to the region of the *Covillea*, creosote bush, a desert shrub of the Southwest. In places it is so dense as to merit the term forest, for the trees prevent a distant view. But it is not uniformly distributed for it does not occupy the drier, hotter bottoms of the valley or soils that are heavy or saline. Loose, deep alkali-free soils, easily penetrated by rain water, mostly on benches or alluvial fans, are the most favorable. The greatest range would not exceed the circumference of a circle 350 miles across and having its center about 100 miles northwest of Needles, California. It is abundant in these portions of California, Arizona and Nevada, but barely enters the southwest corner of Utah. It is not found in Mexico.

The Joshua tree has inspired many people who were impressed with its picturesque beauty and its singular or even grotesque forms. Fremont called it "the most repulsive tree in the vegetable kingdom", but Fremont had seen few of Nature's grotesque trees. Others have sung its praises in verse and prose. One must be cold indeed who can view its ever-changing form, its waxy masses of flowers, and the opening of the great flower buds, without a feeling of wonder and admiration that from so limited a supply of moisture, and under such unfavorable conditions of heat and aridity, Nature has been able to produce so superb a lily.

The Frog Hopper's "Bubble Bath"

Photographs by R. Vishniac

Frog-hopper, "frog spit", "cuckoo spit", horseflies—all these words are used in relation to a group of tiny insects that whip up hiding places of frothy bubbles. But the frog hopper has no more to do with a frog than it does a giraffe; the "frog spit" is likewise unrelated to a frog, and is equally no part of a cuckoo's activity, and the superstition that horseflies hatch from these frothy deposits is an old wives' tale.

Under the microscope the frog hopper, of which there are many species in many parts of the world, does look somewhat like a miniscule frog. This possibly justifies the name. The one that makes the little "bubble baths" so commonly seen is less than an eighth of an inch long. With its sharp little beak it penetrates plant stems and siphons off the sap.

On the previous page is a frog hopper that has passed through several molts and now ventures forth in the vicinity of its frothy home to the end of the leaf, and a typical mass seen on the stems of plants and on grasses. At the left is another typical mass showing clearly the bubbly formation and suggesting the soapy or waxy composition of the home in which the immature frog hopper apparently finds refuge from enemies, and a haven in which it may progress from nymph to winged insect.

Taking nourishment from this—and, incidentally, doing no good to certain garden plants—it discharges a clear fluid from the hind end of its body. This residue is slightly soapy or waxy. Rapidly switching its hind-body, the young frog hopper whips this liquid into a bubbly froth.

The object of this spittle "nest" is a matter of question. Most logically it seems to serve as protection and to provide a place in which the insect may hide from bird or insect that would relish it as food. In the cover of its frothy hiding place the insect goes through several molts, until, at last, it uncovers two pairs of wings. Then it is ready to fare forth on a precarious and brief winged life; and in the fall to lay the eggs from which are hatched in spring more hoppers to make more spittle nests.

Edwin Way Teale, who has studied and photographed this little insect, reports that there is one enemy that is not fooled by the camouflage of the froth mass. This is a species of wasp that seems to know that a young frog hopper is within, and penetrates the mass and extracts the occupant to be added to the larder being set aside for the unborn wasp.

Mr. Teale also reports witnessing a battle between two frog hoppers for possession of one of the glisten-mounds of foam. He had acted as match-maker in this battle, extracting a hopper and placing it near an occupied froth mass. The newcomer, he says, with a quick sidewise movement, tried to shove its way inside. The greenish-yellow back of the owner appeared for a fleeting instant at the surface. Then its foam castle bulged this way and that, as the two midgets pushed and shoved. How long this battle would have gone on, and whether it would have been to the death is uncertain, for Mr. Teale interrupted it by accidentally brushing a leaf across the froth mass. One of the hoppers fled.

"As the young insects grow in size," writes Mr. Teale in *Grasshopper Jungles*, "they produce larger and larger masses of foam . . . There is a waxy element in the composition that gives the bubbles unusual tenacity, enabling them to last for hours. Sometimes, on early morning tramps, I have found empty foam houses of the day before, solid and dry. Occasionally a tiny moth or other insect will be caught in the hardening froth as though on flypaper."

Do It Now

According to those who are supposed to know such things, there will be a tremendous selling and advertising era after the war. According to the governmental post-war planners, there will be unprecedented highway construction, including great transcontinental through highways of modern size and character. These two blueprints for the future have a relationship, one to the other.

During the war years outdoor advertising has suffered a relative eclipse. Rural highway travel has been so little as to offer no attraction to advertisers. Manpower and material shortages have called a halt on new construction. But the outdoor advertising industry is now rubbing its hands with glee at the prospect of uncounted miles of rural countryside that will be opened up by billions of dollars of public money; made ready to be parasitized by unrestricted billboards and other roadside enterprise. That the industry proposes to let no mile of this alone is indicated by a law authorizing construction of 469 miles of "throughway" in New York State. Original legislation provided for a prohibition of all signs within 500 feet of the right-of-way. But the billboard industry forced this restriction out of the measure before it could come to a vote. They want a free hand.

Plans for the great highway program include high-speed "throughways" of "limited access" construction. These will automatically eliminate roadside slums developing from cheap business that must have immediate access to the pavement. It will *not* eliminate billboards, which need no access, but only visibility, and any provisions to limit them, set them back or otherwise restrict them will be everywhere fought by the industry.

These "limited access" highways will pass through some of our most attractive rural regions, and will have the beauty of parkways. That is, they will until the billboard industry can lease sites along these routes and unrestrictedly erect signboards. Then the beauty of the rural countryside will be lost, the safety of travel at high speed impaired by the attention demands of the billboards, and the vast public expenditures exploited.

At a recent meeting of the outdoor advertising industry great plans for the post-war billboard campaign were outlined. Extensive signboard use by producers of food products, cigarets, whisky, automobiles and accessories, soaps and even life insurance policies was announced. New and bigger signs, illuminated signs, and a board that achieves the effect of luminosity in daylight will "adorn" the highway environs.

In anticipation of the coming boom, national advertisers, through their organization, the Association of National Advertisers, are giving much thought to the media they will use. They have retained the Opinion Research Corporation to aid in a study "to help industry in all its public relations, including war and post-war advertising campaigns." National advertisers are not deaf to the very large body of the public that resents the intrusion of the billboard on the rural landscape. They know that it is unwise to advertise their products where they offend the prospective customer.

During these war years of restricted highway travel the American people have been building up a pressure of suppressed desire to get out on the highways. When they are able to satisfy that desire, and then find the countryside cluttered with advertising, they are going to react more strongly than ever against such parasites.

The answer lies in letting the national advertiser know how you feel. Let him know now that you do not want to read his message on the rural landscape; that you will buy some other soap or cereal or insurance policy available from a company that has the good taste to respect the rural beauty of America. Let him know that you do not want your tax dollars spent for great highways that are immediately prostituted to the alien intrusion of the rural billboard. And if you want to know some of the national advertisers who—according to the testimony of the outdoor advertising industry—plan to spend millions on billboard space, we will be glad to tell you their names.

Grin and Bear It — by Lichty

"—And our postwar future I view with pleasure—thousands of miles of new roads our armies are building all over the world—and every mile bare of signs!"

(COURTESY OF THE WASHINGTON POST AND CHICAGO TIMES SYNDICATE.)

PHOTOGRAPHS BY ELSTER

Approach to the cabin at Limberlost Sanctuary, home and workshop of Gene Stratton Porter, and a view of Sylvan Lake from the west woods, a lake that Mrs. Porter renamed Red-Wing Lake.

Limberlost Sanctuary

By CECIL FLOOK

PLANNED as a sanctuary for wild flowers, the Limberlost estate of Gene Stratton Porter has had a varied career since her death. Attempts to make it a State park failed. For a while it was a Boy Scout camp. More recently it was to be a memorial to the author. Now it is threatened with sale and subdivision unless the Noble County Conservation Club is able to raise money to purchase the estate and turn it over to the State for preservation.

When the vast Limberlost Swamp near Geneva, Indiana, was drained, Mrs. Porter moved to a new Limberlost on the shore of Sylvan Lake, Rome City, Indiana. Several things prompted her selection. One was the stand of timber of more species than is ordinarily found in one place. Another attraction was the isolation of the spot. And Mrs. Porter loved the beauty of the shore line of the lake, which she renamed Red-wing Lake for the many red-winged blackbirds found there.

Gene Stratton Porter named her forty acres of woodland, Wildflower Woods. There she planted some twenty thousand specimens of wild flowers and shrubs. Wherever a forest was being cleared, or a swamp drained, she went to rescue the flowers. She had a gift of making things grow for her, and the rescued plants, and the species obtained elsewhere, prospered in her woods.

In recent years many people have made pilgrimages to Limberlost from all over this country and the world. Yet the quiet seclusion of the place has persisted, perhaps because most of the visitors are lovers of Nature themselves, and feel it a sacrilege to molest anything in a spot that Mrs. Porter had worked so hard to make a refuge for the vanishing wild things she loved, and which found place in her books.

A thick hedge of native shrubs—among them magnificent specimens of redbud—nearly hides the entrance. Within the woods one can see, in season, all species of wild flowers native to the State, plus some sent to Mrs. Porter from other states. They vary all the way from the coarse skunk cabbage to the bishop's cap with its tiny, white, fringed flowers. Early in the spring come dainty hepaticas and bloodroots, followed later by trilliums, squirrel corn and Dutchman's breeches, Jack-in-the-pulpits, Celandine poppies, shooting star, and many others. Most of these grow in quantities over a large area. In marshy places down by the lake grow rare orchids, and swamp ferns unroll their giant fronds. In the fall the lovely fringed gentian blooms.

The ignorance of some people often annoyed Mrs. Porter. Once, after considerable trouble in obtaining the seeds, she had planted fringed gentian, hoping to be the first to raise them from seeds, only to have a party of fishermen come in from the lake and spade up the entire bed to get fishworms. Once she planted harebells among maidenhair ferns, and a man going through the woods thought he would be helpful by weeding all the grass out of her ferns. He pulled every last harebell!

One of the first things the visitor notices upon entering the woods is the constant medley of bird songs that fill the air. The birds are unafraid, and if one has a bit of patience, they will often come quite near, as did a pair of yellow warblers that kept flitting among the shrubbery within a few feet of us. King of them all is the cardinal, his flaming splendor flashing from tree to tree (Continued on page 498)

Details of the all-weather feeding station for winter birds devised by Charles A. Davis of Peoria, Illinois. We are happy to present the plans and instructions, which provide an excellent project for the school or home workshop, or which can be built for bird lovers by any handyman.

Interest in feeding wild birds in winter, combined with ingenuity, results in—

A Practical Winter Feeder

By CHARLES A. DAVIS

For many years, between joy-filled days as a Scout and a time when it became possible to settle down, I had to neglect the duty and miss the pleasure of feeding birds in winter. And it was with more hope than assurance that I told my pretty bride, after we had moved into our first apartment in a mid-western city—on the third floor and overlooking a wooded declivity—that we could enjoy feeding birds from our windowsill.

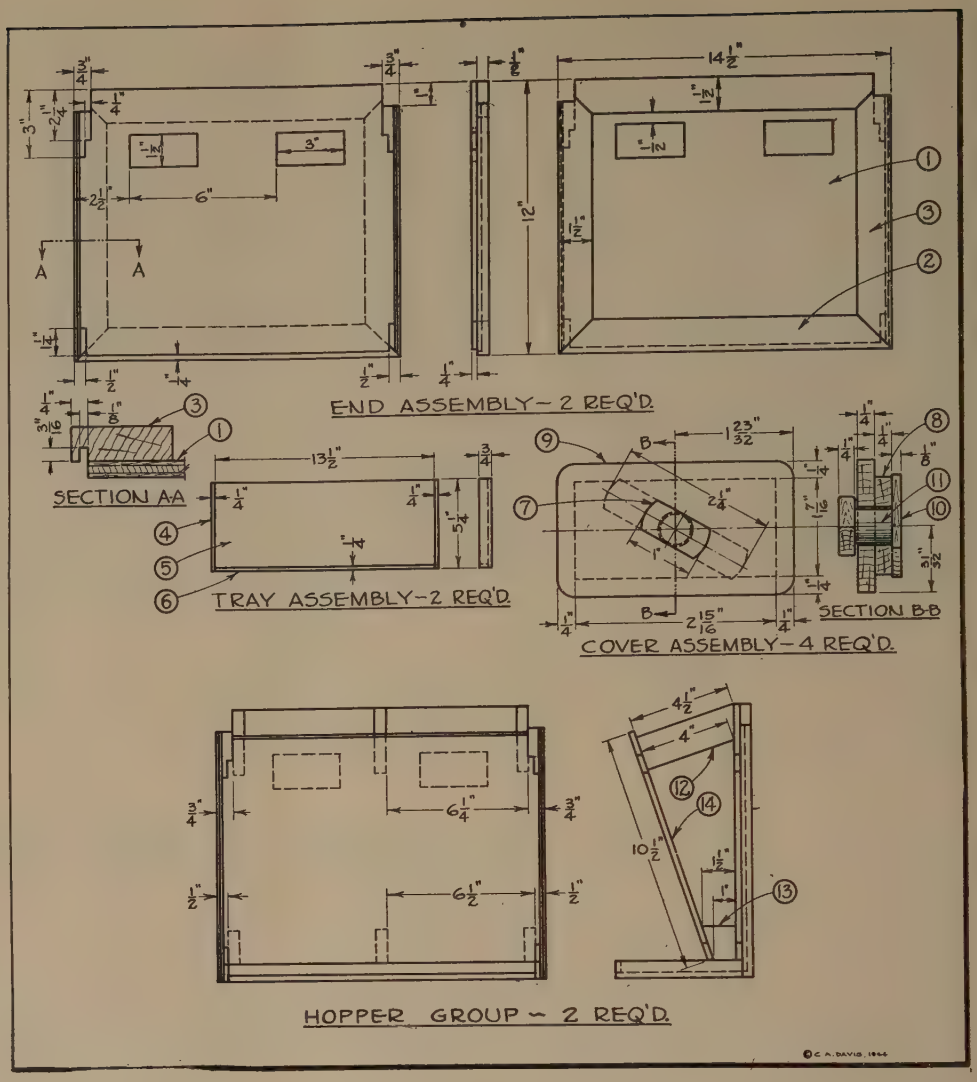
Small, rectangular boxes were affixed to the sills, and, after a few days, single birds began to call. We soon struck up a cordial relationship with several carefree and playful chickadees and titmice. And there were more dignified, even aristocratic visitors—cardinals whose eagerness was nicely restrained to give the appearance of accepting their frequent feedings graciously but with polite hesitancy. In contrast, there were nuthatches, brusque fellows who seemed gleefully to "steal" what they wanted. They acted like paranoiac poachers in a captivating melodrama, until their departing chuckles dissolved the illusion in a flood of appreciation.

Following these experiences, opportunity to occupy a house near the outskirts of town gave us what we thought would be an increase in the winged trade at our window boxes. But we had omitted squirrels from our planning. The height of the vertical wall at the apartment had discouraged them, but the nearness of overhanging trees and the ease of vertical ascent from the ground over the bricks of a bungalow made a difference. Then snow would fall during the night, making the boxes inaccessible to the early morning trade. Covers, arranged against the weather, helped, but were never fully satisfactory, requiring too much attention. It was impossible to discourage the squirrels by feeding them elsewhere, or by less conciliatory methods. So it was the squirrels, the weather, and inherent laziness that brought about the planning and building of an all-weather feeding station.

The feeding station, solving these problems, had an added advantage in that sparrows, in our vicinity at least, have not learned to use it. By dispensing food only as it is used, it tends also to avoid waste of seed. Finally there is pleasure in building it, which is not the least of the benefits.

The accompanying bill of materials, drawings and photographs may appear complicated to some; actually they are simple. One has only to accumulate parts enough to make an *assembly* of these parts; then to place assemblies together with other parts or assemblies to form larger units called *groups;* finally to place groups together with other parts, assemblies, or groups, to form still larger units called *arrangements.* In these days of lady riveters, welders, assemblers, and inspectors, it is not inconceivable that grandma may astonish you some evening by displaying proudly a newly created, all-weather feeding station.

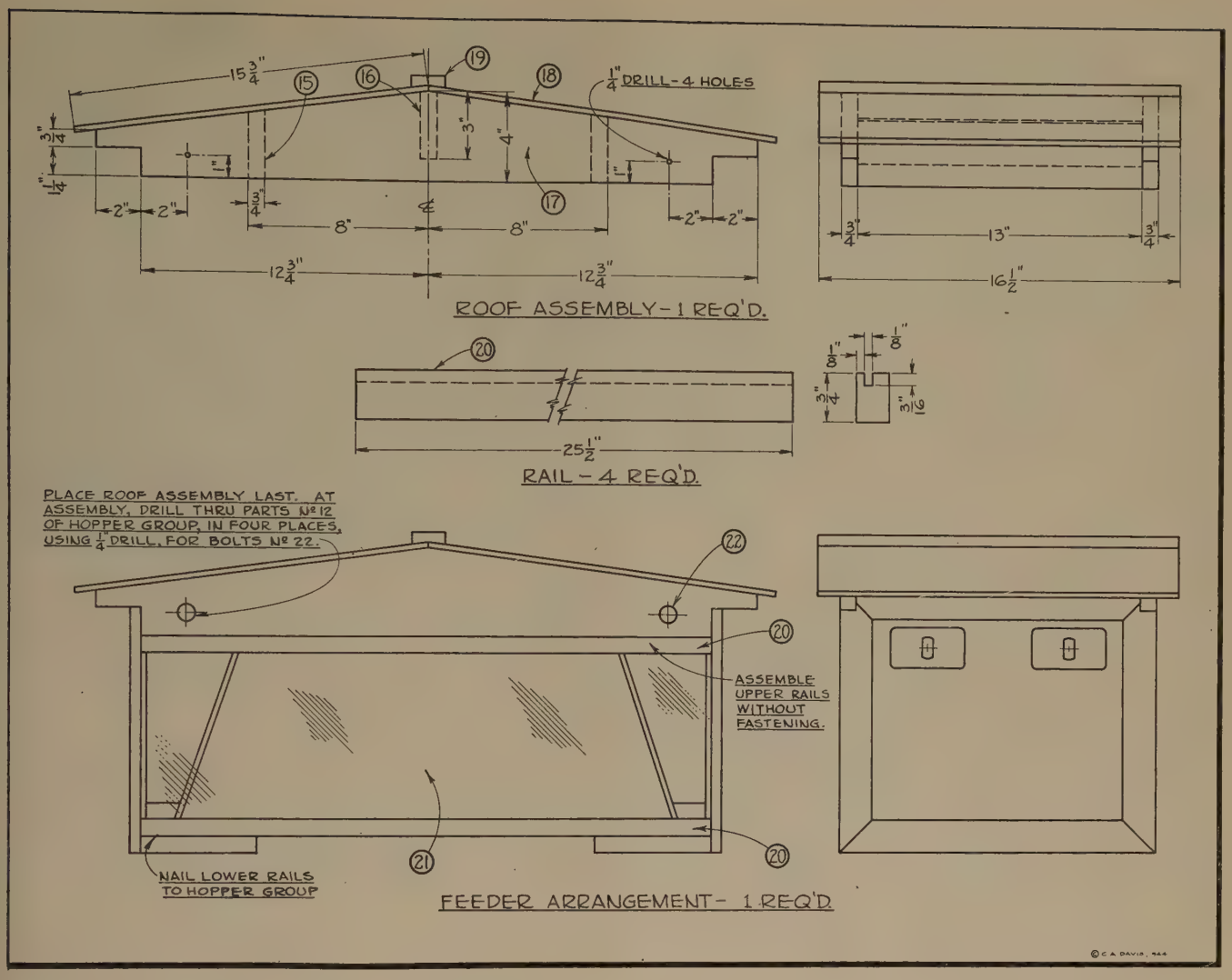
Let us review the building of one of these units. First, the materials must be brought together. The column headed "Description" in the bill of materials (see page 500) indicates the kind and size of material to be used for each part. The number of parts required per assembly should be multiplied by the number of assemblies needed to obtain the total quantity to be used. The dimensions of the parts themselves are given in detail on the drawings. One may find, as I did, that the entire thing can be made from scraps of wood one has on hand, with the help of his own or a neighbor's miniature circular saw. One may have the glass, and may even be capable of cutting it himself. (After breaking two large pieces of window glass, in miserable attempts to learn the knack of cutting, I finally bought the glass sides, cut to size, for twenty-six cents —the only cash outlay made for the entire work.)



The bill of materials tells us that two end assemblies are required. It says also that three different parts and some wire brads are needed to make these assemblies. By reading further, we see that Part #1 is ¼-inch plywood; #2 and #3 are ½″ x 1½″ strips of white pine. One will notice, by referring to Section AA of the drawings, that part #3 has a slot ⅛″ wide and 3/16″ deep cut all along its length. This may be cut on a small circular saw, or, lacking the use of any such facility, the slot can be improvised by the use of two ⅛″-thick strips of wood, nailed or glued together. The materials needed for the end assemblies are to be cut to the size and shape indicated on the drawing of this assembly, and put together to conform, using the wire brads. The fastening may also be glued, using waterproof glue, if desired, although the nails alone will serve satisfactorily if a good coating of paint is applied.

After making the required two end assemblies, two small tray assemblies, of the dimensions indicated on the drawing, are built. Then the four cover assemblies are made. These are intended to close the 1½″ x 3″ openings previously cut in each end assembly. Some may wish to develop some other way of fastening these covers; the one indicated is merely a suggestion.

Having accumulated these assemblies, construct the hopper group. The bill of materials calls for two, and says, further, one end assembly, one tray assembly and certain other parts are required for each. Reference to the bill of materials and to the drawings of the hopper group gives the size, shape, and material for these parts. Having the assemblies and all of the parts, simply combine them to make the two hopper groups. Then the parts for the roof assembly are made in accordance with the dimensions in the drawing, and put together as shown. After preparing the rails—part #20—by sawing the longitudinal slot in each one, as indicated, one is ready for the final assembly. The two hopper groups are set up about two feet apart on a bench, with the trays facing each other. Then two of the four rails are placed, with the slots up, so that the end of each rail fits snugly against part #3 of each end assembly, and into the ½″ x ¾″ opening remaining above the tray assembly. These two rails should be nailed into place. Next, slide a piece of glass into the slots cut in parts #3 on each side so that the glass rests in the upturned slot of the lower rails. Then the upper rails are as-


ROOF ASSEMBLY - 1 REQ'D.
RAIL - 4 REQ'D.
PLACE ROOF ASSEMBLY LAST. AT ASSEMBLY, DRILL THRU PARTS Nº 12 OF HOPPER GROUP, IN FOUR PLACES, USING 1/4" DRILL, FOR BOLTS Nº 22.
ASSEMBLE UPPER RAILS WITHOUT FASTENING.
NAIL LOWER RAILS TO HOPPER GROUP
FEEDER ARRANGEMENT - 1 REQ'D

sembled, over the glass, with the slots pointing downward to accommodate it. The upper rails should not be fastened. Leaving them loose facilitates replacing the glass, should this be necessary. Last, the roof assembly should be placed by pushing it down firmly upon the upper rails. With the roof in position, place a ¼" drill into the holes already drilled in parts #17 of the roof assembly, and drill right on through parts #12 of the hopper group. By this method one is certain to get the holes in direct alignment for fastening. Then push ¼" x 1¾" carriage bolts into these holes, and place a washer and nut on each. This last operation will require a little dexterity, but it may be accomplished by reaching through the 1½" x 3" holes in the end assemblies. After giving the entire feeder and the four covers two or three coats of good paint, the covers may be placed into the 1½" x 3" holes to finish the work.

Small colored transfers of wild birds may decorate the sides of the roof assembly as an added touch. The transfers sold in the five-and-ten weather very well.

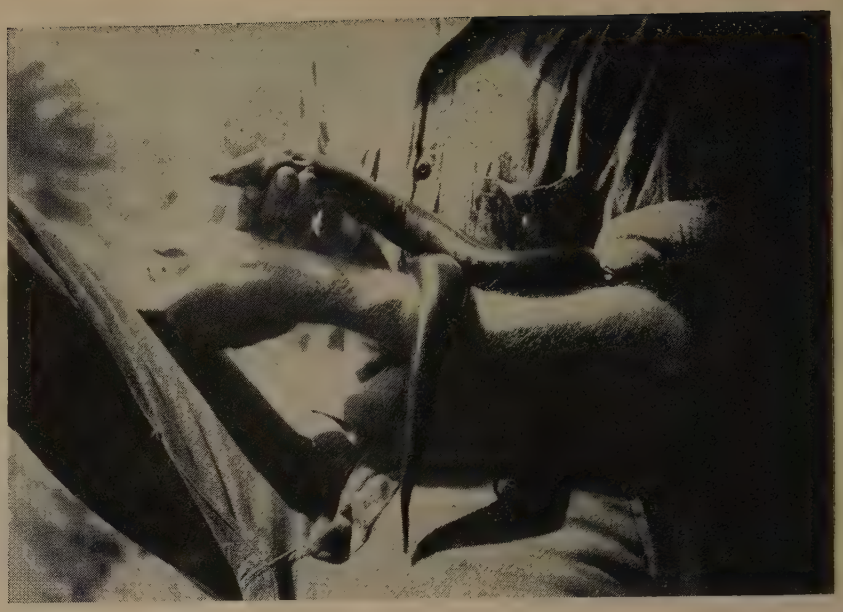
One of the most revealing pleasures we have experienced in the use of this station came during the first days of its introduction to our guests. Shifting from sill boxes, we anticipated some "indoctrinating period" might precede any whole-hearted and confident acceptance of the new-fangled feeder, because it had to be entered through an opening in the bottom by means of an interrupted flight of rather precise execution. We did not wish to have any bird afraid to repeat his first attempt because of unexpectedly encountering the transparent glass sides. To induce confidence, and to "educate" our guests, we tried a simple expedient. A screw eye was placed at the center of the bottom edge of part #16 of the roof assembly, and from it a 1" square stick, about four feet long, was suspended vertically. This stick had several ¼" holes drilled through it so that the original windowsill boxes could be fastened to it temporarily. The holes were spaced in a manner to permit moving of the boxes upward to other positions successively nearer to the open bottom of the feeder as rapidly as they might be accepted and used with confidence.

The first callers were chickadees, who came to the boxes within the hour that the feeder was installed, and after five hours had elapsed, several chickadees, nuthatches, and titmice were using them. During this period, the boxes were elevated to within two feet of the bottom of the feeder. They remained in this position most of the second day, (Continued on page 500)

Recently a young reader in the South sent in a most accurate drawing and description that testified to unusually keen observation of a strange animal he had seen. What was it, he asked. We told him, and because the telling was so interesting we immediately went into the file for this article on—

Amphiuma—the Congo Eel

By ROSS E. HUTCHINS



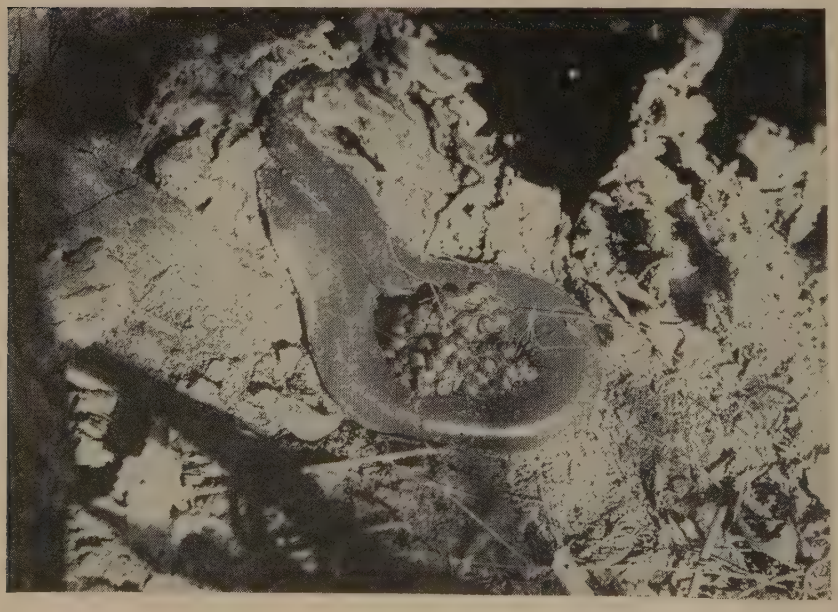
Amphiuma, with its pointed snout, tiny limbs, small, lidless eyes and pair of open gill slits, looks like a snake or eel but is really a big brownish salamander.

It is hard to say just how or where the Congo eel, or Congo snake, received its name, because it is neither eel nor snake, and it did not come from Africa. It is really a large salamander whose legs have become greatly reduced and of little value in locomotion, and it has little use for them since it spends most of its life in the water. It is a little-known creature, shrouded in mystery and superstition and feared by many as a deadly reptile.

Neither fish nor snake nor eel, *Amphiuma* looks like each. Its jaws are long and powerful like those of the eel, and the general lines of its tapering body suggest that animal. It is a good swimmer like the water snakes, progressing through the water by rapid undulations of the body. Similar to its cousin the mudpuppy, its skin is covered with slime and is without scales. The jaws are armed with stout teeth, while the eyes are small and bead-like, and probably of little use.

Comparatively little is known of the complete life history of this creature because it inhabits the dark pools and bayous of the South, often hiding in crawfish burrows. In isolated spots, where the lazy brown waters softly lap the swollen cypress boles and the sunlight filters downward through climbing vines, *Amphiuma* lives, feeding upon small fish, tadpoles and insect larvae, and often growing to a length of nearly three feet. Sometimes it is seen in the shallow water where the small streams enter the bayous.

There are two species. *Amphiuma means means*, with two toes on its little feet, ranges from Virginia south to southern Florida. It intergrades with *A. means tridactylum*, its three-toed and usually larger cousin, found in Alabama, Mississippi, Louisiana and Texas and on up the Mississippi to Arkansas, Tennessee and Missouri. Both forms may be found in extreme west Florida, Alabama, Mississippi and Louisiana. *Amphiuma* seems to leave the water only to lay her eggs and to care for them until hatched. During the late summer she crawls laboriously from her favorite pool, using the small legs so ill adapted for travel upon land. Slowly she makes her tortuous way over the soft earth between the cypress knees. A few hundred feet from the water's edge she selects a decaying stump, or a fallen log, and hollows out a space in the soft, decomposing wood. There she curls up, and there, after a time, are laid about two hundred eggs (Continued on page 498)



***Amphiuma* curls in her nest in a hollow of a stump, guarding her eggs that are linked together like pearls. There she waits until the waters rise and young can emerge through the softened shells.**

"STILL LIFE" By Michelangelo Caravaggio

Study of a painting by the Italian Naturalist artist, Caravaggio, reveals—

A Curious Find

By J. S. WADE

On the wall of one of the rooms in the National Gallery of Art in Washington, D. C., hangs a painting by Michelangelo Amerighi Caravaggio. It is entitled "Still Life," and shows a variety of fruits on a dish and on a table. To the casual visitor, "doing" the gallery as a part of a visit to the National Capital, it is just another of the still life pictures of fruits, vegetables and such. To the student of art it is a fine example of the work of a tempestuous member of the Naturalist group of Italian artists of the later years of the sixteenth century.

To a pair of economic entomologists, wandering through the gallery after lunch, however, the picture was a startling surprise. The artist with great fidelity to Nature—even including a fly walking along the table at the left—had carefully painted the depredations of a codling moth, or "apple worm." This, to the entomologists, meant that this insect existed in a province of Italy at least 335 years ago, for Caravaggio died in 1609.

This little detail, missed by practically everyone else seeing the picture, sent the entomologists off to the libraries of Congress and of the Department of Agriculture. The scientific mind sometimes works that way. There they found that apparently the first published account of the codling moth was by Goedaerdt in 1635. It was not until 1728 that Frisch gave a somewhat grotesque yet quite accurate description of the moth and larvae, and opined that it worked in unhealthy and injured fruits. He gave, however, no data on the life history, leaving it for the naturalists Reaumur, in 1736, and Roesel, in 1746, to

perform this service. Thus, 127 years after the death of the painter Caravaggio, Roesel supplied hand-painted figures of extreme accuracy of detail and coloring of *Carpocapsa pomonella*, as this insect is known to science.

Caravaggio, the entomologists found, lived from 1569 to 1609, and was celebrated as painter of frieze and other decorations in the Vatican, and as a painter of natural history subjects. His real name was Caldara, but, as was common in those days, he took his name as an artist from the place of his birth, Caravaggio, near Milan. He appears to have painted portraits at Milan, moved on to Venice and arrived in Rome some time between 1585 and 1587. He first carried bricks for the masons working on the Vatican, and while thus laboring attracted the attention of Raphael, then engaged on his great pictures in a loggia of the palace.

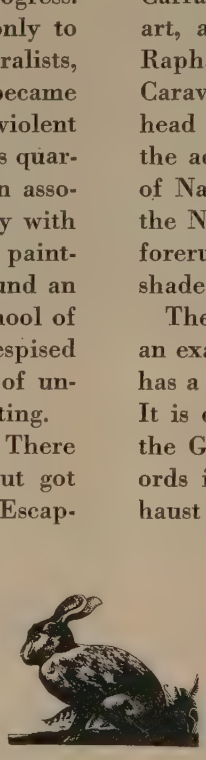
Finally finding a patron in Cardinal del Monte, Caravaggio seems to have made rapid progress. Throwing aside all tradition and appealing only to Nature, he became head of the so-called Naturalists, as opposed to the so-called Mannerists. He became popular and had a large following, but a violent temper also created many enemies. Not all of his quarrels were provoked by him, but he did kill an associate and had to leave Rome, finding sanctuary with the Duke Marzio Colonna near Palestrina, and painting for him. Moving on to Naples he again found an appreciative public, fostering a naturalistic school of some importance there. Particularly he despised every sort of idealism, and became the head of unmodified imitators of ordinary Nature in painting.

Malta appears to have seen Caravaggio next. There he painted a number of religious pictures, but got into an altercation and wound up in prison. Escaping, he turned up in Sicily to do paintings in several cities there. Finally, at forty, pardoned by the Pope, he set out in 1609 for Rome, was waylaid along the road after leaving Naples, and died from his wounds.

Caravaggio's best work may be divided into two periods. In the first he did not make such prominent use of the dark shadows and high lights that characterize his later period, and which became the most prominent characteristic of the Naturalistic school. Most of the works of this period are genre pieces executed during his stay in Rome. The works of his second period were mostly larger religious compositions, the result of the reputation already established by his genre productions. Some of these aroused considerable opposition, particularly in Rome, on account of the very ordinary types used by him to portray the saints that the church adored.

The artist exerted great influence upon the development of modern art. Even the principal pupils of the Carracci, like Guido Reni and Guercino, studied his art, and Domenichina was influenced by it, while Raphael used the young artist in his own work. Caravaggio may be justly considered the founder and head of the Naturalistic school of painting, and as the advocate of a return to Nature and the methods of Nature, his influence extended beyond Italy into the North, where he influenced Rubens and was the forerunner of the great Dutch masters of light and shade.

The National Gallery of Art is fortunate in having an example of the work of this great artist. His work has a worthy place along with its other art treasures. It is quite possible that sharp eyes may discover in the Gallery still other unexpected and unusual records in natural history. It would be difficult to exhaust the possibilities of this fine national gallery.



At Dusk, the Thrushes

By ETHEL ROMIG FULLER

Again as shadows lean to brush
The lips of day, and whisper *hush,*
Far and faint, calls one lone thrush.
Little brothers, hidden, shy,
Snatch the words as they drift by
And toss them on, till very sky
Is criss-crossed, silken thong on thong,
With such a net of joyous song
As to the heavenly choirs belong.

When a planet lights a spark
Above the new moon's crystal arc,
The skein's unravelled in the dark,
To be rewound, note after note,
On the bobbin of a throat—
Save only one, soft, hill-remote . . .
A heart that hears turns helpless pawn
To dreams once dreamed in youth's bright dawn,
And lost again, it too withdrawn.

Phil E. Zimmerman, who is the nominee of Topeka, Kansas, as a modern Johnny Appleseed. From his garden each year come thousands of packets of flower seeds, all given away in the cause of spreading beauty through flowers. He is also founder of the National Society of Long Fellows, which campaigns for longer beds and bathtubs, higher awnings and ceilings for tall men. "Zim" is six feet, three inches.

Phil Zimmerman and His Flower Seeds

By MARGARET WHITTEMORE

"It was not a fortune, but a seeming misfortune, that brought me the realization of a lifetime dream," declares Phil E. Zimmerman, Spanish War veteran of Topeka, Kansas. When, in 1932, a motorcar crash ended his business career as State hotel inspector, he was given the choice of spending the rest of his life in a veteran's hospital or living out of doors. Having been a flower lover since childhood, he chose the latter alternative and began the cultivation of a plot of ground, eight by eighty feet in extent, on the south side of his home. This garden has not only brought health, countless friends and unbounded satisfaction, but has inspired hundreds of other people to find joy in flower-raising.

An important part of Mr. Zimmerman's hobby consists in giving away flower seeds and plants. During the past five seasons he has distributed more than 10,000 packages of the seeds of new and choice flowers, all grown in his garden. Hundreds of potted plants for winter blooming are given to friends each spring and autumn. Cuttings from flowering shrubs are first well started and then given away.

On Lincoln's birthday he presented each member of the Kansas Legislature, the Governor, his office staff and other high employees with a garden of flowers, comprising some 900 packets. Mrs. Alfred M. Landon, Mrs. Harry Woodring, the Governor's wife, and others rely almost wholly on his judgment regarding the selection and care of garden flowers.

Since federal regulations forbid shipment of seeds from uninspected gardens, Mr. Zimmerman distributes his packages at meetings and through organizations. Hundreds of people come to his home when Topeka papers tip them off that seeds "are ripe"; some (before gas rationing) driving as far as 200 miles to get them.

Scores of youngsters, black and white, have been given seeds and plants and encouraged to grow little gardens. A bad child, Mr. Zimmerman declares, is one who has never made the acquaintance of flowers. To a juvenile judge he proposed an idea that he sentence some charges to him to start new gardens. The children in his own neighborhood for twenty blocks around have received specimens of his best growing plants, and, incidentally, gained a new and wholesome appreciation of property rights.

As a booster of the "More Pants in the Garden" movement, Mr. Zimmerman is leading men in a friendly invasion of the women's garden club territory, and proving that men who grow flowers are not sissies. It is unnecessary for one to be born with a green finger, he declares, or to know the botanical names of common garden flowers. A couple of standard seed and nursery catalogs will give valuable information. After the seeds are planted according to directions, an occasional tickling of the earth with

hoe or rake, and from then on the gardener will coast on his own momentum.

"Deep in the heart of every true flower lover," he says, "lurks this thought: 'It is my wish, my hope, my prayer, that I may leave this world just a little more beautiful than I found it.'" On every general packet Mr. Zimmerman puts out is the following quotation from Abraham Lincoln: ". . . die when I may, I want it said of me by those who knew me best, that I always plucked a thistle and planted a flower, when I thought a flower would grow."

Next to war bonds, the best investment on earth is the time and energy spent by a citizen in beautifying his home environment, Mr. Zimmerman believes. "Those patriotic citizens who so successfully engineered the Victory Garden movement," he declares, "have unconsciously done the spade work for any future beautification program. They proved to hundreds of novices that they can grow things; that things will grow for them if given a little care or attention. Having learned that, it will be but a natural evolution for them to go in for flowers in 1945. This will augment, rather than conflict with, the vegetable garden program."

A few years ago Mr. Zimmerman bought a new home where he now cultivates a plot of ground containing 7100 square feet. Six years back it was pure basement clay. One hundred varieties of flowers, mostly annuals, beautify the place during the summer months. From December to February Mr. Zimmerman spends his time packaging the seeds for his hosts of friends. Last year he distributed some 2500 packets, using for the purpose old envelopes, scrap paper, and such, and a quarter-mile of adhesive tape. In mimeographing the labels he incorporates appropriate slogans, such as "Love me, love my flowers."

While everything is given away, and nothing sold, the adventure has yielded rich dividends. Mr. Zimmerman's health has improved and he has forgotten his troubles. "Don't pet your hard luck," he advises. "The more attention you give it, the longer it will follow you." A friend of his who is also regaining health through work with a garden is quoted as saying, "A flower in the ground is worth two in your hand."

In 1941 Mr. Zimmerman gave a bushel of hollyhock seed, and other varieties, to the State Highway Department for the beautification of Kansas roads and thoroughfares. He induced a friend to gather and donate two more bushels. The idea took on and many others contributed. He supplied Angel's Trumpet seeds to beautify the grounds of Winter General Hospital in Topeka, a hospital for world war veterans.

Two morning glories, which he developed from Japanese stock, he calls "The Glory of Kansas" and "Helen Gould." The former has a flower five inches in diameter, red with a purplish tinge, and silver leaves. The "Helen Gould" is a rare crimson morning glory, the only one of its kind in America. It was named for the "Angel of the Spanish-American War." Many soldiers received from her hands their first hope of comfort, recovery, and a safe return home. Mr. Zimmerman says that she was instrumental in saving his life.

"Zim," is he is called by his fellow-townsmen, is a civic booster with a reputation for starting things and then getting them done. While serving as State hotel commissioner he founded the National Society of Long Fellows. That was in 1927. Applicants for membership were required to measure at least six feet and one inch in their shoes. Phil Zimmerman is himself six feet, three inches tall.

The organization of Long Fellows worked to promote the comfort of the tall man through longer beds; long bathtubs; higher awnings, signs, ceilings; longer Pullman car berths. Much good was accomplished; hundreds of hotels from coast to coast being equipped now in the Long Fellow mode. Auto factories adopted seat adjusters. Furniture companies produced oversize pieces, and clothiers recognized the tall man in making garments. Style alterations were made to aid the tall man.

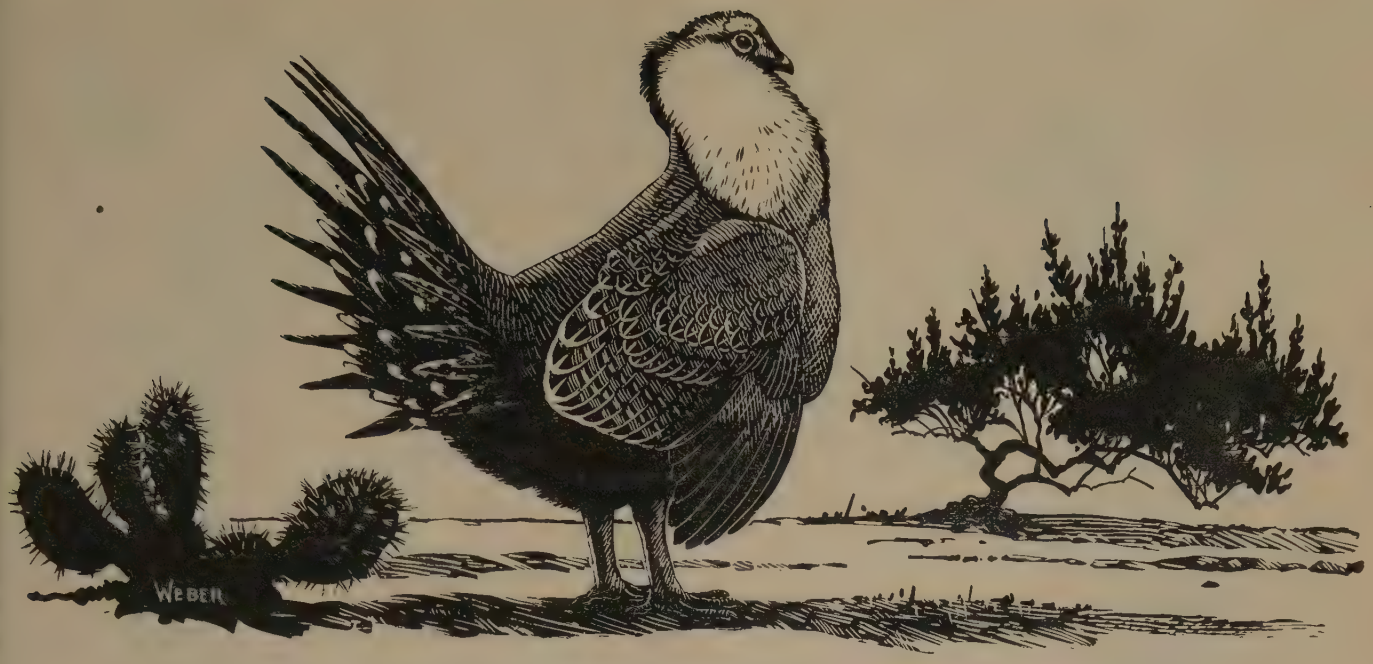
Even more far-reaching in its effects, according to Mr. Zimmerman, has been his flower hobby. It has resulted in world-wide contacts. His seeds are now growing in Alaska, Manila, Hawaii, the Canal Zone, equatorial Africa, and even in the garden of an ex-President of Cuba. When the Japanese took Hong Kong, there were twenty beds of Zim's flowers growing in the yard of one of the finest Chinese homes there. Like Johnny Appleseed, he is represented in every state, territory and possession of the United States, and is responsible for from two to twenty-five gardens in each of the 105 counties of Kansas.

★

Brown Thrasher

By AGNES MACCARTHY HICKEY

How well this thrasher on our dogwood tree
  Blends with rich Autumn's russet coloring
And as he pecks red seeds methodically
  He seems so unafraid. This creaking swing
Does not disturb him. Only now and then
  He stops and with swift, speckled eyes looks down
Assuring safety. Ignoring us even when
  Our large, white news-sheets rustle, while we frown
Lest this newcomer startle and so veer
  Away to seek some more secluded place
Where we, unhappily, may not be near
  To study his neat markings and his grace
And then, perhaps, long Winter months must pass
  Before one of his kin comes to our grass!



Sage Grouse Memories

By MAY S. DOANE

Illustrated by Walter A. Weber

SAGE grouse are today far from plentiful, for man, dog, and gun combined are fast exterminating them. Since the young are the best eating, they are recklessly hunted in the open season—and often in the closed. Yet one who has lived in their country in the days when these speckled grouse were plentiful and pecked in peace in the sagebrush, treasures many interesting memories of them.

First as a Wyoming bride, and later as the mother of three little persons, I roamed the hills and "draws" of the homestead country in quest of glimpses of wildlife. One spring, when the first little chickens among my Rhode Island Reds were running about the yard, I rode with my young husband on the running gear of the wagon to Deer Creek after a load of posts. It was a long, uncomfortable ride, but the day was sunshiny, the sky was blue, and I was very much in love with life. It took him a long time, I remember, to cut those posts; then, on top of the load, we started for home. When, through the gathering dusk, we had made about half of the return trip, we saw a whole covey of tiny sage chickens, speckled and round, running hither and thither in the grass, peeping in a lonely sort of way. Immediately I wanted to domesticate the little things. To humor me my husband climbed down from his load, and, after dodging about grotesquely in pursuit of the tiny mites, he handed two of them up to me. Holding the frightened babies in my hands, I mothered them all the way back to the ranch. There I slipped them under an old hen, whose day-old babies had gone to bed under her wings. The next morning, however, the tiny wild things were gone.

I made another attempt, however. If they would not take kindly to the ways of a Rhode Island Red mother when brought to her, they might, I reasoned, do so if they were hatched under her wings. Finding a nest full of warm, speckled eggs, I took two of them, brought them home, and put them under an old biddy. In due time the chicks broke shell, but, a few hours later, I found them burrowing in the corner of the hen house. I could not coax them to eat, and they died, along with my hopes of ever domesticating a sage grouse.

Again my husband and I were together, this time riding bumpily over a sagebrush flat in the old one-horse buggy. A sage hen arose clumsily almost from under the wheels. It looked as though we must have crippled her. I climbed out of the buggy to examine her injuries. She would not be caught but fluttered on ahead of us. All at once it dawned upon me that Mrs. Sage Hen was not hurt. She was decoying me from her nest. Rather crestfallen, I returned to my bantering husband. First, however, I found the nest upon which the gray-brown "fool hen," as she is sometimes called, had sat unnoticed among the sage. The nest was full of olive-tinted, brown-speckled eggs. I pulled the brush back over it and stole away.

Another time, in that same old buggy, I was driving over the hills with my little son as company. His childish ears caught a plaintive "Peep, peep!" In the grass beside the trail, a tiny sage chicken scuttled to cover. "Oh, mother, it's all (Continued on page 498)

To use this map hold it before you in a vertical position and turn it until the direction of the compass that you wish to face is at the bottom. Then, below the center of the map, which is the point overhead, will be seen the constellations visible in that part of the heavens. It will not be necessary to turn the map if the direction faced is south. Time given is Standard Time; add one hour for War Time.

Stones that Fall from the Sky

By ISABEL M. LEWIS

EVERYONE is familiar with the streaks of light that dart swiftly across the sky so often on clear moonless nights. Those who watch the heavens know that the showers of these meteors, or shooting stars, as they are called, return regularly each year at the same time when their orbit intersects that of the earth. These are mere dust-like particles that are caught by the earth's atmosphere, are entirely consumed by the friction produced by their passage through it, and settle to the surface in the form of meteoric dust. Usually they follow in the orbit of some comet, and are composed of particles driven off from its head and scattered along its path. Eventually the head of the comet, which is composed of gases and meteoric masses of considerable size, is so stripped of its substance that it shines faintly, if at all. The mass of rocks and stones held loosely together by their mutual gravitational attraction, and weighing anywhere from a few grams to millions of tons individually, continues to hurtle on through space at a velocity of a score or more miles per second.

From the heads of comets meteoric masses of considerable size may be broken off and scattered along the path by the action of planets or other disturbing bodies. Some of them may come eventually close to the earth and penetrate its atmosphere. They are not, as is the case with dust-like meteoric particles, entirely consumed by the friction of their passage through the earth's atmosphere, because of their greater size. According to this theory the meteorites are the parts of disintegrated comets that belonged to the head or nucleus. When they enter the atmosphere they are not, like meteors, silently consumed.

Accompanied by blinding flashes of light, heavy detonations, and rumblings as of thunder, they follow a course through the atmosphere that may be thousands of miles long. Finally, they fall to earth. Often they are called fire-balls, and their flight may be observed by millions of people although the actual fall to the ground may be seen by no one. Sceptics were slow to believe that these were actually stones that fell to earth from the sky.

In the year 1913 a procession of fire-balls, consisting of groups eight or ten in number and containing several fire-balls each, passed over a distance of nearly 6000 miles from Saskatchewan to Ontario and out over the Atlantic to a point near the Bermudas. There they disappeared in the ocean. The rumblings, detonations and earth tremors that accompanied the display, as well as the great brilliancy of the various members, were noted by millions of people for some miles either side of its course, although in regions where the sky was cloudy the phenomenon was not recorded. The procession was most spectacular near the end of its course after it had passed out to sea. The brilliance of the display and the detonations were then greatest and were seen by ships at sea and many residents of the Bermudas.

Meteorites appear to fall impartially in all parts of the earth, although falls and finds are naturally reported in greatest numbers in the densely populated regions. Two of the most remarkable finds, however, have occurred in the most desolate regions of the earth, that of the Cape York meteorites in Greenland obtained from the Eskimos by Commander Peary, and the Great Siberian meteorites of June 30, 1908, which fell at 7 o'clock in the morning in the desolate and sparsely-populated regions of swampy forests between the Lena and Yenisei Rivers. The area of this great fall is now known as Meteorite Fields. This is probably the greatest and most spectacular fall ever recorded, a rival in modern times of the great meteorite that several thousand years ago fashioned the great Meteor Crater, near Winslow, Arizona, which is 4200 feet across and 575 feet deep.

The fall of the Great Siberian Meteorite, which was, in fact, a group of meteorites, or one individual broken into many parts, was observed, fortunately, by only a few in the near vicinity, but the accompanying detonations, resembling heavy artillery or thunder, and the terrific explosion and vast column of fire and smoke that accompanied it, had been seen for hundreds of miles by many people. Seismographs at universities, hundreds and thousands of miles away, recorded the earthquakes that its fall produced. Years later three expeditions visited the region during the period 1927-1929 under the leadership of Prof. L. A. Kulik and sponsored by the Academy of Sciences of the USSR. A most interesting review of Dr. Kulik's report is given in *Science* for May 11, 1928, by the late Prof. George P. Merrill. The most remarkable feature of this fall was the felling of trees in the forest in the immediate vicinity. These were badly scorched, and were broken by the tremendous force of the air waves that attended the fall of the meteorite. They lay along radial lines to distances of seventeen miles from numerous pits and craters that dotted the region, formed evidently by the fall of many meteoric masses. The meteorites themselves, probably because of the swampy nature of the region, have penetrated the soil so far that they have not been recovered. It is believed the main masses of the fall weigh thousands of tons and are buried at depths of twenty-five to fifty yards.

Some of the largest and most interesting meteorites have been found in Mexico. Next in size to the four individuals of the Cape York find of meteorites, which aggregate more than forty tons, is the Bacubirito meteorite that lies in a plain in Mexico and is a gigantic iron weighing about twenty-seven tons, and measuring more than thirteen feet in length. A house has been built over it by the Mexican Government in the place where it was unearthed in 1902 by Dr. H. A. Ward. Two remarkable meteorites in the Mexican collection exhibited in the School of Mines in Mexico City are the masses known as the Chupaderos irons, which weigh respectively about 30,000 and 15,000 pounds. Their jagged edges show that they have been torn asunder, possibly in their passage through the atmosphere.

The third largest meteorite is that of Willamette, Oregon, which weighs about 31,000 pounds. These meteorites are all iron meteorites, or Siderites. All meteorites in this class consist essentially of an alloy of nickel-iron and iron sulphides and phosphides. The other two classes of meteorites consist of the Aerolites, or Stony Meteorites, and the Siderolites, or stony-iron meteorites, (Continued on page 500)

Shining Key

By MARCUS Z. LYTLE

No homesick exile walks tonight
Without a blessing on familiar stars;
On Jupiter, enthroned across a town
Past desert summits, stained with arid Mars.
Capella's amber flames again through oak,
And Sirius blooms cool on lemon trees,
While white Canopus on horizons south
Shakes with the glitter of Antarctic seas.

Aldebaran, red signal fire of winds,
Antares, orange lamp of summer heat,
And bright blue Vega like a cooling draught
Of mountain air across an August street;
Arcturus on the laureled hills of spring,
Or Fomalhaut through crisping sycamores—
Each one is glowing in the air of home,
A shining key to dear, accustomed doors.

The School Page

Edited by E. LAURENCE PALMER

Professor of Rural Education, Cornell University, and Director of Nature Education, The American Nature Association

We Must Decide! But How?

FOR FIVE usually most inspiring days I have sat through the papers, speeches and messages presented at the meeting of the American Association for the Advancement of Science in Cleveland. As this is being written the last paper is being read. The experience has been revealing—as is generally the case with such meetings—and there is definite significance in many of the ideas offered; possibly even greater significance in the reactions to their advancement.

One evening, with a friend, I attended the first Cleveland showing of the motion picture "Wilson." We had just emerged, both of us in a patriotic fervor that left us practically speechless, when we noticed a man standing by the curb outside the theatre. As we passed he remarked, in a bored way, "It was not very exciting, but it was historical." Somehow, both my friend and I felt that such a remark, at such a time and place, was significant. We both repeated it frequently in the next few hours, and it brought home the fact that we are not all alike; that what is worth while and important to some of us has no meaning whatever to others. History in the making in the present, or a review of history made in the recent past, was to us just about as exciting an experience as possible. Yet one individual, at least, bemoaned the fact that what he had just seen was "not very exciting."

To some this may not seem an appropriate text for the school page of a magazine devoted to Nature. Yet such differences in human reactions were also evident at the meetings of the presumably more similarly-interested group attending the A.A.A.S. While the papers were significant and attendance at the different sections meaningful, the reactions of those attending held particular interest for me.

I devoted one whole forenoon to the tenth annual meeting of the National Association of Science Writers, "cutting" a rather important business meeting to attend, and I was not disappointed. One man said that the science messages in his paper each week reached some twenty-eight million people; another declared that in the last twenty years he had written some four and one-half million words of popular science for his papers. And, whether we listened to the man responsible for the material in the leading medical journal of the country, or the man responsible for the most blatant Sunday supplement, there was an expressed desire to present all sides of an issue, to check and recheck for accuracy. Above all, there was the goal to print nothing that would do harm to the advancement of science, or to the appreciation of the contributions of science. Somehow I believed these men more than I believed some of those I heard on other programs. And, because these people reached primarily the mass of readers, I was greatly encouraged. Somehow I seemed to need to know that there was an important group trying to reach and to improve that man outside the theatre.

What other benefits from this meeting can I pass on to readers of this page? I was impressed by the significant absence from the technical meetings of the so-called leaders in science education. They might have profited—in reverse—by a paper on the marvels of modern science presented on the last day by one science education leader. He elaborated on the millennium in which we will live when the insecticide D. D. T. will be generally available to spray around our homes and in our yards and kill off all insects. He mentioned, as desirable, one spray that would be effective for some 300 days to kill insects that came in contact with it. All in all, he displayed a startling lack of the scientific imagination that is essential to scientific procedure, and that demands that we see as many sides of an issue as possible. He did not recognize what would happen in a world without insects, nor did he know that one of the problems before the National Research Council is what to do to save the insects that serve as plant pollinators. Nor did he know of the resolutions adopted by the economic entomologists urging caution in the use of these newer destructive chemicals, about which not enough is yet known. This talk was a perfect example of what lack of imagination could do with a generalization, or, possibly, what a single-track imagination could do with a generalization.

At a meeting of the Ecological Society of America an "educator" expounded on subject matter and method in science. He defended the deductive technique on the ground that, as a teaching technique, it was six times as fast as the inductive method. In his closing remarks he gave me the "gem" of the whole meeting, when he recommended covering ground rapidly by use of the deductive method, illustrating his point by an example of the inductive technique. He proposed presenting by that method some "small unit" such as "inorganic chemistry, evolution, climate, taxonomy or physiology, and civilization, the flow of energy and materials in a modern community, mechanics, the structure of organisms, the human life cycle, or health and disease." I have not been the same man since. Would that such educators as he had the philosophy advocated by the science writers, in part at least. Fortunately he does not reach a reading public of twenty-eight million each Sunday.

Meetings like the one I have been attending are good for the soul. You hear presented many conflicting ideas. Many papers, such as that just discussed, receive considerable free-for-all criticism in discussion periods. In this democratic clearing house of ideas each man has the chance to make himself heard. It is distressing, however, that after the speaker has made his speech he does not often remain to hear what the other fellow has to say. There was, of course, the usual petty politics of most meetings of Americans. Few of those engaged in these behind-the-scenes intrigues had time to attend the technical meetings where they should have been. And there was the usual 'power politics" where one group had gained a little financial assistance and threatened to "read older established groups out of meeting" if they did not "join up now." There were the "lame ducks" found in all groups of Americans, and a very few of the "play boys" more conspicuous in gatherings of less serious groups. There was the patriarch who gave half a dozen of us a never-to-be-forgotten

Compensation

By PAUL CHURCHER

If curiosity killed a cat,
It is certainly lucky that
Boys are not of the feline species—
Think of the corpses in knee-length breeches!
Still, for the teaching of nature to
This is a virtue not askew,
Exceeded only, for instruction,
By extremely fortunate construction;
In view of their proximity
To the ground, they're bound to be
Architecturally apropos,
Missing nothing that crawls or grows.

account of one of his exciting explorations, even after the hotel attendant had turned the lights off in the lecture room where we lingered. Out of all of such experiences we must decide what is best for us; what best suits our needs. On the whole, the Cleveland meeting was one of the best I have ever attended, and I have a notebook full of useful ideas to use until they are displaced by other notes from similar meetings.

This year we face world and national politics, with the problem of deciding what view we shall support. Are we going to be like the "little red hen" and defend to the last the wealth and advantages we have made in America for a happy life, or must we fear the big "red" menace that might outlaw all private property? Are we to defend a spendthrift policy, or support a policy based on the idea that we are great, in part, because we have wealth, and that should that wealth be dissipated we would be in no position to make our influence felt? Are we to support a group that recently made me pay twenty-six dollars to hire one man, who could not speak English, to dig a ditch for one day, or are we to support a group whose record with labor has not always been an enviable one? What are we to do? D. D. T. can kill all the insects in my yard, but do I want all of them killed? Can we not work out a middle-of-the-way path? Must we make everything spectacular and exciting? Must we be drunks or prohibitionists? Is there not a saner way to solve our problems than by using only the deductive method or the inductive method in science teaching, and a better way to work out our international future than by being isolationists or Santa Claus? We must decide! But how? The immediate future will be both exciting and historical.

Conservation Teaching

At its annual convention in Pittsburgh, the National Education Association adopted the following resolution:

"CONSERVATION EDUCATION — The National Education Association, knowing that many natural resources essential to life are being depleted at an alarming rate, urges increased emphasis upon the teaching of conservation, and recommends the immediate preparation of the appropriate materials for this purpose."

This action will be hailed by conservationists who have long pointed out that a conservation viewpoint for the future must be built through the schools. It is now to be hoped that some collaboration may be achieved between educators and conservationists to the end that the needed teaching materials may be made available. There is no time to waste.

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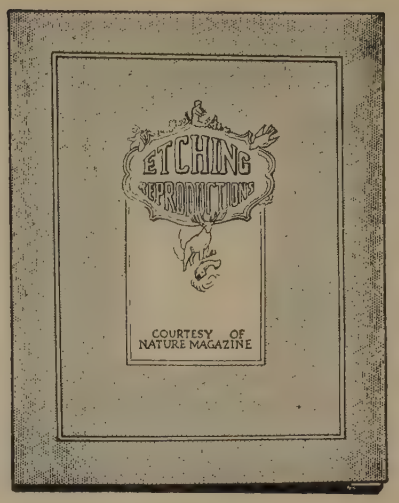

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BIRDING ON THE JOB

By REGINALD W. JULIAN

After ten years of daily toil in the heart of downtown Los Angeles, the change to a store having the Los Angeles River 150 feet away in one direction and the Santa Monica Mountains two and one-half blocks in another, yet still within the city limits, was a mighty welcome one.

My first inkling of the birding possibilities here, although on the job, came one day when I stepped outside the back door of the store for a breath of air and startled a road-runner meandering along behind our building. The door slamming behind me sent him tearing down the alley and over a six-foot fence. It was not long after this I discovered cliff swallows were trying to establish a colony under the eaves of the houses just across the alley from us, but the residents were not going for it and were scraping down the nests as fast as they were being built. The urge to intercede for the birds was strong but since the antipathy toward them seemed pretty unanimous I thought it wise to let events take their own course. If these little settlers looked elsewhere for homesites as diligently as they strove to outbuild the destructive efforts of their evictors, it could not be very long until they would find a more compatible neighborhood.

One morning a lady taking her little girl to school stared incredulously at me as I suddenly pulled my car to the curb, climbed out and peered intently into her neighbor's front yard tree. From the expression on her face she must have thought I was looking for my ancestors, but I actually was wondering why a dozen cedar waxwings will crowd themselves together on a few twigs when a whole tree is available. There was not long to wonder, though, as they soon took off in that unceremonious way birds have, leaving one feeling as though his company might not be too highly regarded. They seemed so carefree but I wondered a little about that too, as a sharp-shinned hawk hove into sight from over the hills.

While returning from lunch one day a sort of rattling bird call came from the direction of the river and I hurried over to have a look. My suspicions were confirmed upon seeing a kingfisher sitting on a sewer pipe spanning the river. He skimmed back and forth from the pipe to a willow limb a couple of times, oblivious to the heavy motor traffic only a short distance away, which is probably accounted for by the fact that the river bed at this point lies about twenty-five feet below the street level.

All in all, I have been able to make forty-three positive identifications in this general vicinity. Hardly a day passes that I do not see something a little rarer than a linnet. For instance, the ash-throated flycatcher that lit on the brush pile (to which the whole neighborhood contributes) on the vacant lot back of the store; the phainopepla silhouetted against the sky on a high telephone wire; the pair of black-headed grosbeaks on a nearby fence; an Arizona hooded oriole nervously working his way from limb to limb of a small sycamore across the way; a Nuttall's woodpecker in a walnut tree, the single survivor of a former grove; a lone red-tailed hawk soaring endlessly overhead without a flap of his wings. All of this a veritable symphony of bird color, form and song unfolded for those who are blessed with the inclination to see and hear. I much prefer it while wearing a leather jacket and boots along some primitive terrain, but it is really delightful having this shaft of sunlight streaming through one's work-a-day existence.

MANTIDS IN SCHOOL

By MABEL A. BARKLEY

Boys and girls have been bringing mantis egg cases to the school laboratory year after year. We have all watched with interest as the little, thread-like bodies emerge and begin to run over the desks. One morning we were doing some food testing when the mantids emerged. I flipped some sugar water on the desk and window sill, where the little insects were crawling. They lapped up the solution. Next we tried sprinkling some egg solution about. They seemed to like that, too. For a week we supplied this diet, and finally put some fifty mantids in the greenhouse, continuing to feed them. Bits of liver or fresh meat were offered on toothpicks and the mantids seemed to know they were in friendly hands when handled by the youngsters. When school closed in late June we had more than a dozen half-grown mantids in the greenhouse and these were released to do their part in insect control. Each year we try to raise a few of these insects in the laboratory, feeling that we are thus giving a few extra mantids a chance to live and carry on their fight against insect enemies. It is an interesting project for any school.

Redwoods League

At the annual meeting of the Council of the Save-the-Redwoods League Duncan McDuffie of Berkeley, California, was elected president. He succeeds Dr. John C. Merriam, a founder of the League and its president for twenty-four years. Mr. McDuffie is widely known as a civic leader and conservationist. At the meeting progress was reported in the program of the League for the preservation of additional units of redwoods in the Mill Creek area, in Del Norte County, and the Avenue of the Giants, north of High Rock near Dyerville, Humboldt County. Acquisitions will be made as funds permit. The membership of the League has now reached 10,000.

A Fungus Trap

The discovery of the first fungus known to trap and destroy insects is announced by the Agricultural Research Administration, U. S. Department of Agriculture. It is a microscopic soil inhabiting fungus, said to be "unmistakably adapted to prey primarily on insects" and "under natural conditions presumably is given wholly to a predaceous mode of life."

According to the scientist who made the discovery, Dr. Charles Dreschler, Pathologist of the Plant Industry Station, Beltsville, Md., there are more than 60 fungi known to capture animal organisms, such as amoebas, nematodes, rotifers, and other small forms, but the new one, called by the discoverer *Arthrobotrys entomopaga* (the second part meaning "insect trapper"), catches springtails, insects that jump by means of springy near-end spines. They are found frequently on decaying vegetable matter and are known sometimes to attack economic plants in the growing stage as, for example, alfalfa in Australia.

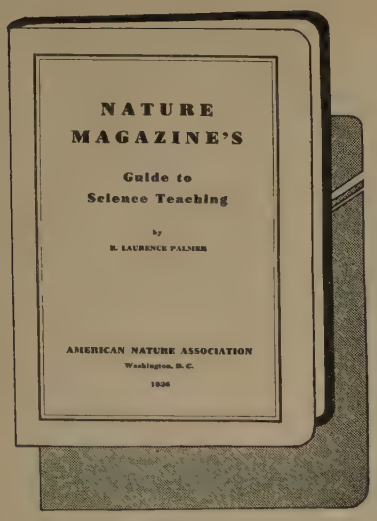
The fungus is of the type that sends out horizontal threads or hyphae that crisscross and actually join at the intersections to make a network that may be likened to a piece of electrically welded wire fencing in miniature. This network sends up columns that exude at the tops droplets of a clear adhesive liquid, the death trap for the springtails. Once caught, the insects are run through with a cobweb of filaments that transfer the food elements from their bodies to the fungus.

Although Dr. Drechsler has given this new species of *Arthrobotrys* the name of insect trapper, he does not think it likely that this is the only fungus that lives in this way.

He suspects there are others that likewise prey on minute insects inhabiting porous decaying materials. He believes that some of these fungi, as for example those attacking nematodes, may be a factor in protecting plants against parasites.

Middle America Gardens

Under the direction of Dr. Wilson Popenoe, international authority on tropical agriculture, the United Fruit Company has founded a school of Pan American Agriculture at Zamorano, Honduras. Appropriately it was officially inaugurated on Columbus Day, October 12. The courses are designed to prepare the youth of Middle America as extension specialists in agriculture. The school will be conducted on a workshop basis, and represents an answer to the challenge and need for better technical education in tropical agriculture.



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FANNIE WAS A BAT

(Continued from page 460)

I am sure from other indications. such as her alighting upon my chest, and the slightly different demeanor upon being handled by other people, that she knew me without question.

Fannie afforded unusual and happy days all summer, but in the fall it became necessary to make an extended trip of considerable distance. By vote of the family, Fannie was liberated. It was unceremoniously done. Our absence lasted several weeks; then a return trip to our mountain cabin before our final exodus for the year. The evening of our return I went to the same place by the water's edge where Fannie had been captured months before. There I stood quietly, one arm extended, my fingers holding a fluttering moth. At length, out of the twilight and from among the many bats in flight there came one. It paused for an instant, then vanished into darkness —back to eerie haunts and fabled legend.

Walker Prize Award

Announcement is made by the Boston Society of Natural History, 234 Berkeley Street, Boston, Massachusetts, of the 1944-45 contest for the two prizes founded by the late Dr. William Johnson Walker. These are for the two best original essays based upon the results of unpublished research, and the current contest is for essays on mammals. Details of the contest and manner of submission may be obtained from the Boston Society of Natural History. The contest closes May 1, 1945.

New Research Chief

Dr. Clarence Cottam, who has made a distinguished record as research biologist with the U. S. Fish and Wildlife Service during the past fifteen years, has been appointed Chief of the Division of Wildlife Research. He will succeed Dr. William B. Bell who has retired from that post. Dr. Cottam has done intensive laboratory work in economic ornithology and mammalogy, field research on management of waterfowl, upland game, depredations and control of injurious birds, marsh ecology, refuge management, and the coordination of wildlife conservation with other land and water uses.

Reading Problems

Two important meetings on reading problems are to be sponsored during 1945 by the School of Education, Pennsylvania State College, State College, Pa. First will be a Seminar on Reading Disabilities, from January 29 to February 2, 1945, and, second, a Conference on Reading Instruction, from June 26 to June 29. Further information may be secured from Betty J. Haugh, Reading Clinic Secretary, Pennsylvania State College.

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Even Old Santa draws upon the wealth of Nature subjects to fill his bag of gifts. He is a busy fellow and sometimes gets a bit careless. Sometimes the only compliments his gifts are worth are the compliments of the season. He has a big heart, but occasionally needs a suggestion.

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LIMBERLOST SANCTUARY

(Continued from page 482)

or framed through an arbor, a fitting tribute to the author of *The Song of the Cardinal*. Mrs. Porter wanted this to be a sanctuary for birds as well as wild flowers.

Winding walks of irregular stones lead here and there around the cabin, which is built of cedar logs from Wisconsin and roofed with California redwood. Scattered around over the grounds are numerous rustic seats and vine-covered arbors where the author used to go to observe the birds. The spring is walled in with Indiana "pudding stone", a conglomerate of glacial origin.

The interior of the cabin reflects the personality of its builder in many ways. As Mrs. Porter could not bear to feel shut in, the windows and inner doors were so planned that from her study she could look outdoors to a beautiful scene in any of the four directions. The rooms are panelled in the lovely red of wild cherry cut from the site of the cabin. There are three fireplaces—in the dining room one of English brick that matches the panelling in color; in the living room one of stones sent from all over the United States, with Indian axes supporting the mantel; in the study one of "pudding stone", small bright-colored stones embedded in white.

The pictures on the walls are enlargements of Nature photographs taken by Mrs. Porter, and original paintings given her by artist friends. Cases are filled with Mr. Porter's collection of Mexican pottery, and with Indian relics, shells, and Nature curios sent by people everywhere because they knew Mrs. Porter would appreciate their beauty. In one case are some of the original water colors of moths made for *Moths of the Limberlost*. When Mrs. Porter wrote this book, the illustrations that were made for it looked so little like the real moths, that she decided to do them herself, painting them from live specimens with painstaking care to reproduce exactly the colors and markings. The moths were given their freedom when she had finished with them. Here hangs the leather mail bag that Mrs. Porter carried with her to contain the specimens she gathered. A Dutch door leads from the hall to the porch, which overlooks the lake.

Surely this spot, to which so much love was given by a woman who brought Nature to many, is worth the saving, both as a sanctuary and as a memorial to her.

SAGE GROUSE MEMORIES

(Continued from page 491)

alone—and it's getting night." Over the wheel he scrambled, and, down on all fours, he started after the chick. "Poor little chicky, poor little chicky," he kept coaxing. And then, evidently out of nowhere, a feathered fury crashed into his face. The sage mother had flown to the protection of *her* young. I, too, rushed to the help of my baby.

My fondest memory of sage grouse is of an evening, almost at sunset, while riding on horseback after the cows. On an alkali flat, not more than three rods from the trail, some forty or more sage-grouse cocks were holding a mating carnival. Perhaps there were some admiring hens hidden away among the brush, but I did not see them. The cocks were all in full dress—and yellow and gray being their chosen colors. The great yellow air sacs on the sides of their necks were inflated until they were so enormous that they protruded upward, outward, and downward, completely covering their breasts. Their wings were stretched downward in a fan, and their tails were spread in a bristling flare. With heads high they were strutting about, all the time making a grunting noise. Sometimes, however, they seemed to forget their dignity, for they leaped into the air, rolled on the ground, or danced in high glee. It was a sight worth coming many miles to see.

Ever farther and farther from the highways, the sage-grouse are retreating. Before extermination comes to them, let us hope that the western country will arouse to the need of more stringent protection.

AMPHIUMA—THE CONGO EEL

(Continued from page 486)

the size of small marbles.

These are not like ordinary eggs because they are all connected by a string of tissue. *Amphiuma* coils about this mass, which is usually about as large as a man's two fists. She seldom leaves. At this time she is very pugnacious, defending her precious eggs with her sharp teeth, and an intruder will do well to keep his hands at a safe distance. If disturbed at this time she often gives a low squeal, this being the only instance known of a member of the salamander tribe expressing itself in sound.

Here in her nest mother *Amphiuma* waits—waits for the rains and the rising waters that will inundate the lowlands and cover the nest. Then the eggs are ready to hatch, and through their flexible and transparent shells the young salamanders may be seen coiled up inside. On dry land they would be helpless, but Nature has made the wise provision that they can not hatch until the waters rise, enter the nest and soften the tough egg membranes, allowing the young to emerge. Upon hatching they are delicate creatures about two inches long and with feathery gills on the sides of their heads for breathing under water. They feed upon small animal life and grow rapidly. About ten days after hatching the gills are lost and they become air breathers like their mother. The flood waters recede and the lowlands are again a muddy morass, inhabited only by raccoon, wildcat, and other wildlife, but mother *Amphiuma* and her flock are safe in the still, dark waters of the bayou.

ROCKING ANIMALS

(Continued from page 472)

the more tightly it becomes wedged. This anchors it securely. If split board rockers are used, the legs are cut as in (C) and pegged with hardwood pegs to the rockers (D).

The head is cut roughly from a section of a log into the shape of the animal's head. The features of the animal are painted in oil colors (E). The head is the only part of the animal that is painted. The whole finished job may be coated with waterproof varnish.

Antlers and ears are fastened to the head with blind wedges and tails are pegged. The tails sometimes serve as a back to the rocking animal, and prevent the young rider from slipping off the back of his rearing charger. This is shown in the deer, beaver and rabbit. The ears and antlers serve as handles for the young horseman. The stick in the beaver's mouth also is used for this purpose.

The backwoods rocking animals are attractive and salable, and may help to swell troop and club treasuries, as well as making interesting displays for exhibits.

Movie Contest

Amateur motion picture enthusiasts are invited by the American Humane Association, 135 Washington Avenue, Albany 6, New York, to enter a contest the purpose of which is to create a friendly, kindly interest in animals through motion pictures. Prize awards totalling three hundred dollars are offered. The films may cover pets, domestic animals or wildlife. The contest runs until March 31, 1945, and full details may be obtained from the Association at the address given above.

Under Nazi Noses

Frederic Joliot-Curie, famous French chemist, former associate of Marie Curie and husband of her daughter, Irene, worked under the very noses of the Nazis as a member of a resistance group planning the liberation of Paris. Pretending collaboration, Professor Joliot-Curie worked at the Municipal Laboratory of Paris, where confiscated arms and explosives were stored. The director of the laboratory, although appointed by Vichy, was a friend of resistance. While German physicists worked on the floor below, members of the laboratory staff made explosives for the coming liberation drive. On the staff, also, was an engraver for the Bank of France, who forged identity papers for members of the Maquis.

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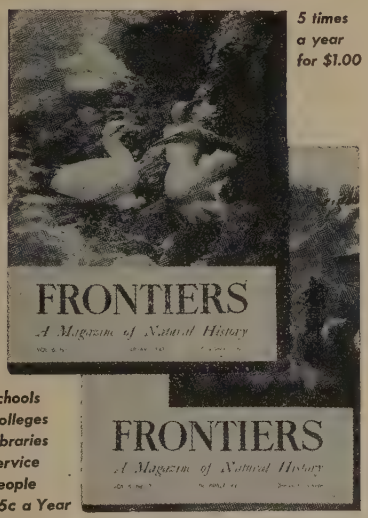

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Blackbird Antics

Report of an interesting assemblage of blackbirds was made by a father in a letter to his bird-loving son, and the young man's mother, Mrs. Clara Hard Rutledge of Montgomery, Alabama, passes on the story. The boy's dad wrote:

"We went last night to the old vacant lot by the depot to watch the blackbirds go to roost. There are a number of large trees in the area, and every night, between sundown and dark, the blackbirds come by the thousands and circle and weave and maneuver at a height of about five hundred feet. They wheel and turn and do fancy figures for about thirty minutes, and all the while new recruits arrive in bunches of a few up to extra thousands and merge in the general pattern. Then, as the dusk deepens, they separate into upper and lower layers often flying in opposite directions and the effect is that of large snowflakes, although a little off color. Finally they seem to get back into full formation again and circle the block as a whole. As they pass over the trees a flock of several hundred will detach themselves from the mass and, doing the falling leaf, will sideslip and stall into the trees. This is repeated time and again as the main flock circles; the detachments break away without hesitation and apparently no uncertainty on the part of any individual as to whether or not his turn has come. Finally, while the main flock is still of large proportions, they all with one consent drop out of the sky, and the clouds can be seen again, or maybe a few dim stars. I don't know why the limbs on the trees don't break, for, in the uncertain light, they seem to be in full leaf, with a light wind stirring. We wondered if the birds had group leaders, but finally agreed they must be inspired communists influenced by mental telepathy!"

Honoring Penn

Tercentenary observances of the birth of William Penn in 1634 are being held in Pennsylvania this fall. In connection with this a booklet entitled *Hemlock, The State Tree of Pennsylvania,* has been revised and reissued. Written by Henry E. Clepper, it was first published by the State of Pennsylvania in 1934. It is an interesting and well-rounded story of this tree, told in a 28-page pamphlet.

Iowa Monument

The Iowa Conservation Commission has completed the purchase of the 1000-acre Yellow River Mound Area in Clayton and Allamakee counties for eventual transfer to the National Park Service for administration as a National Monument. The tract includes more than one hundred Indian mounds as well as some of the roughest terrain in Iowa's "Little Switzerland" district. This will be Iowa's first National Monument.

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ASSEMBLY	PART NUMBER	QUANTITY PER ASSEMBLY	DESCRIPTION
END ASSEMBLY 2 REQ'D.	1	1	¼" PLYWOOD
	2	2	½" X 1½" WHITE PINE
	3	2	"
		20-25	5/8" WIRE BRADS
TRAY ASSEMBLY 2 REQ'D.	4	2	¼" PLYWOOD
	5	1	"
	6	1	"
		10-12	5/8" WIRE BRADS
COVER ASSEMBLY 4 REQ'D.	7	1	¼" X ½" WHITE PINE
	8	1	¼" PLYWOOD
	9	1	"
	10	1	⅛" X ½" WHITE PINE
	11	1	7/16" DIA. DOWEL
		8-12	5/8" WIRE BRADS
HOPPER GROUP 2 REQ'D.	END ASSEMBLY	1	SEE ABOVE
	TRAY ASSEMBLY	1	" "
	12	3	½" X 1½" WHITE PINE
	13	3	"
	14	1	¼" PLYWOOD
		12-14	1¼" FINISHING NAILS
		6-8	5/8" WIRE BRADS
ROOF ASSEMBLY 1 REQ'D.	15	2	¾" X 3" YELLOW PINE
	16	1	"
	17	2	¾" X 4" YELLOW PINE
	18	2	¼" PLYWOOD
	19	1	½" X 1½" WHITE PINE
		40-50	1" LATH NAILS
		16-20	2" FINISHING NAILS
FEEDER ARRANG'M'T. 1 REQ'D.	HOPPER GROUP	2	SEE ABOVE
	20	4	½" X ¾" WHITE PINE
	21	2	7 15/16" X 25 3/16" GLASS
	ROOF ASSEMBLY	1	SEE ABOVE
	22	4	¼" X 1¾" CARRIAGE BOLTS
		6-8	1" LATH NAILS
	COVER ASSEMBLY	4	SEE ABOVE

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A PRACTICAL WINTER FEEDER

(Continued from page 485)

but were moved upward another eight inches before twilight. By this time, many of the birds had already investigated the inside of the feeder, but few were using it consistently. It seemed to us they were encouraged somewhat by the genius of a solitary Carolina wren who appeared the first day and went directly into the feeder without more than a perfunctory appraisal of the suspended boxes. He must have possessed a recurring appetite, for he satisfied it many times, after his first visit, by flying directly to the edge of the enclosed trays, executing a graceful dip to clear the lower rail in full flight.

After dark on the third day, the suspended stick and boxes were removed altogether. Sparrows had not acquired the requisite confidence, but, to our disappointment, neither had the cardinals. All other callers had quickly developed the flying skill and the knowledge of the reward. Their confidence in both was complete.

We have decided since then that this feeder is too small for cardinals. It would require pin-point flying for a bird having such a wing-spread to enter the opening without touching. In a wind it would be a truly hazardous stunt. These regal creatures continued to call regularly, however, eating seeds tossed out by other birds, or placed by us in a spot accessible to them. Their increasing attention to the feeder last winter led to our observation of a faint, though recognizable, expression of pique in their otherwise royal demeanor. We believe they may still evolve some "slip" or "stall" tactic that will enable them to enter safely with partially folded wings.

Of course, the size of the feeder may be made larger to suit local conditions. The one described has been highly satisfactory for chickadees, nuthatches, small woodpeckers, titmice, Carolina wrens, and others in the same range of sizes.

Methods of supporting the feeding station must necessarily depend upon where it is to be used. As designed, it may safely be suspended by a single wire to the midpoint of the peak of the roof, some provision being made to prevent its swaying in the wind. In our installation, as reference to the photographs will reveal, the feeder was supported between 2 x 2 posts, about eight feet long, which were provided with adequate bracing near the bottom for rigidity. This method seemed to us advantageous because the portability of the device made it convenient, early in the fall, to place the feeder directly outside of our window for observation, and to remove it at the close of spring to release the garden space below the window for flowers. A pipe in concrete emplacement is conceivable, or ingenuity will suggest other permanent or temporary supports. Whatever scheme is used, it is important to maintain a clear space entirely free of obstruction for a distance of at least three feet beneath the shelter. It is essential, if squirrels abound, to place collars on posts, wires, or supporting or structural elements to keep the rascals out of the feeder.

A written account of our experiences in developing a mutually worthwhile plan for feeding wild birds can hardly convey an adequate picture of the compelling enthusiasm with which we look forward annually to the renewal of that happy entente. However, in tracing the hopeful early experiments by which we learned the need for greater convenience and for protection from rodents and weather, the advantages of such a feeder have become evident. The description of its making discloses that it is an inexpensive and not too difficult project for the home or school workshop. The method by which it was introduced to the birds has shown this process to be a most interesting one for observation. One may find, as we have, not only that it attracts numbers of birds to one's neighborhood in the winter, but also that an increased number and variety will frequent the place in the summertime, even though feeding be discontinued during this season. It is as though fifty kinds of birds were catching insects in the summer to pay for the service of feeding five varieties during the winter. Surely this is tithing in reverse!

STONES THAT FALL FROM THE SKY

(Continued from page 493)

which have a network, or sponge, of metallic iron filled with the substance found in stony meteorites. Meteorites can never be mistaken for stones of terrestrial origin. If a sawed surface of an iron meteorite is polished and etched with an acid it will show the characteristic and beautiful crystalline structure known as Widmanstätten figures. Stony meteorites are often glazed with a thin, black, surface crust and have dark veins along lines of fracture. This black crust is a nearly perfect glass due to fusion of its substances by the heat generated in its passage through the air on its swift flight earthward.

A remarkable feature of stony meteorites that makes them distinguishable from stones of terrestrial origin is the existence in them of many globular or oval drops of crystalline minerals known as chrondrules. Like volcanic rocks, stony meteorites and those of the other types are of igneous origin and show signs of a slow cooling from high temperatures. They are never porous. They are so characteristic in their structure and composition that they are distinct from all terrestrial rocks.

A most interesting fact about meteorites is that in general they penetrate the surface of the earth to a distance of only a few feet. Many have been turned up by the farmer's plough, and often they are found partially exposed. They are, moreover, rarely hot when picked up immediately after the fall, and are even at times covered with frost or extremely cold. This is due to the fact that they have been traveling through the frigid cold of space, for long periods of time, and their swift passage through the atmosphere of only a few seconds duration heats their surfaces only very slightly.

If one is particularly interested in the subject of meteorites it will be found treated in a most interesting and popular manner in *Our Stone-pelted Planet*, by H. H. Nininger, Curator of Meteorites in the Colorado Museum of Natural History.

In the month of November will occur the usual meteoric shower of the Leonids in the hours before sunrise on November 13-15. The radiant lies within The Sickle of Leo, and the members of the swarm will appear to come from that general direction.

Mars will be in conjunction with the sun on November 14 and invisible throughout the month. It will pass from the evening to the morning sky on that date. Mercury will be in the evening sky all of the month and may be glimpsed low in the southwest the last few days as it nears eastern elongation, but is poorly placed for observation. Venus is now a fine evening star setting about two hours after the sun. Jupiter is conspicuous in the morning sky in Virgo, rising about five hours before the sun. Saturn now rises in the northeast in Gemini about three hours after sunset. It will be close to the moon on November 4.

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SPRING

By JAMES A. WILKINS, M.D.
Lynchburg, Virginia

Nature's simple beauty is infinite in the hills in springtime, and she guards it for the glory of the humble searcher with the faith of a child in the perfection of its mother.

Along Hunting Creek in the Thunderhead Range of the Blue Ridge Mountains, the trout-fisher is active then, and he petulantly changes his lures when the catch is small. He will cast till dark and then cook supper while he listens to the cascading waters of the rocky run, for as a hardy man relishes the delicate and garnished things prepared for him at home, the more will he enjoy the baser foods in the woods.

Redbud trees and dogwood, rhododendron and laurel, Indian paint brush, fronded ferns and wild iris cover the mountainsides, and the stately trillium is sometimes found standing alone in ecstasy.

When a shower comes we shelter in a mighty ledge of ancient granite and feel the thunder's echo roll. The air fills with warm vapor blended of rain and earthy smell, and, satisfied that life is good, we watch birds scurry through the new green of trees and brush.

A robin darts in and busily pecks the ground in imitation of raindrops to further frighten an earthworm toward the surface, for the thrush nests early. The appetites of their young are as large as their mouths, if the pause in wonder of the parent bird is a sign, just before he drops a looped worm into the chasm.

He returns and again drills his staccatoed taps, cocks his head to the side, fixes an eye on the slightest movement of the earth, digs down with a mighty swoop of his beak and tugs out yet another worm, or part of one, and bolts away with a raucous little cackle, glad of life.

In his silly stance he directs the sight of one eye to the earth and the other to the heavens, waiting for the worm and the hawk at once.

But he is more wise than his witless pose hints, for the thrush, not being endowed with the gift of rotating its eyes for the better focus on an object, received instead from Nature a double talent by which it can watch the worm in the ground and the hawk in the sky in the same stand.

Thus, from a seeming handicap, Nature has fashioned an advantage; an act which the scoffer will not clearly see, for Nature ever hides her secrets from the careless eye, and a rainbow will vanish from the scorner's prismatic view.

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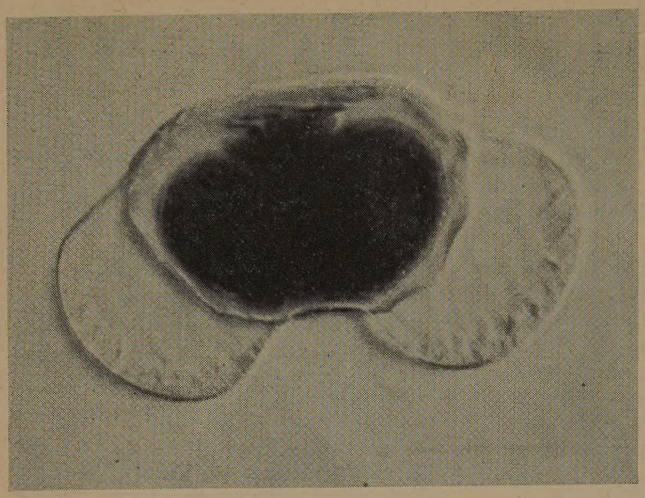
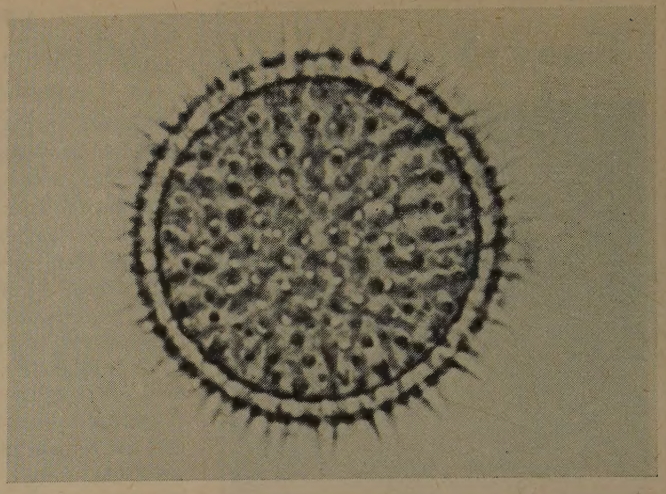


Pollen grain of pine magnified 1400 diameters



Hollyhock pollen grain magnified 500 diameters

Under the Microscope

By JULIAN D. CORRINGTON

POLLEN GRAINS

If you were to expose a coated microscope slide to the atmosphere at almost any situation, you would be certain to entrap numerous particles of floating matter, collectively and anonymously termed dust. The character of this dust would vary from place to place and from season to season, at one time showing a preponderance of clay particles swept up from the soil in wind erosion, or carbon particles from the soot of factory chimneys; at another time perhaps it would be bacterial or protozoan cysts, or plant spores and pollen grains. The last-named are especially abundant when the prevailing winds blow from forests, prairies, or weed or grain fields.

Pollen grains are not only fascinating to study as objects of interest and beauty under the microscope; they enter our lives in many ways, having contributed much to the study of structural and evolutionary botany, to entomology, and to medicine. A glance at these three interwoven aspects of the subject will demonstrate its importance.

As far back as we can go in recorded history, men knew that the date palm was sexed, and that it was necessary to have both male and female trees in order to produce fruit. Such diœcious plants are, however, not common, and the fact that the great majority of angiosperms or flowering plants have what the botanist terms perfect flowers, with both stamens and pistils, operated to delay recognition of the presence of sex in plants. An occasional scientist, as Nehemiah Grew, believed that plants had sex, but the great majority denied or ignored the proposition. The first to prove it, using the experimental method, was Rudolph Jacob Camerarius, professor of medicine at Tübingen, and an ardent botanist. He picked off unripe male elements and found that no fruits resulted, whereas if he transferred pollen to female flowers or to the pistils of destaminated perfect flowers, then fruits were formed. These proofs appeared in his *Letter on the Sex of Plants,* in 1694, and met with wide acceptance, notably by Linnaeus, who founded his plant classification on the numbers of stamens and pistils, a plan called the sexual system.

The next major step reached its culmination in the work of the amateur, Wilhelm Hofmeister. Without university training and while employed in his fathers's bookstore, this brilliant young man so organized and directed his own efforts along the lines of his botanical interests as to execute one of the most beautiful series of researches in the entire history of science. By means of superb microscopical preparations, Hofmeister demonstrated that all plants, from the higher algae through mosses and ferns, to cycads and conifers, and finally to flowering plants, reproduced by an alternation of generations. One generation, called the gametophyte (gamete-bearing plant) produces eggs and sperms; the fertilized egg grows into another sort of plant, the sporophyte (spore-bearing plant), which bears non-sexual spores; germination of the spore results in another gametophyte generation, and so on in an endless cycle. Thus a generation reproducing sexually alternates with one reproducing asexually.

Hofmeister traced the formation of the angiosperm embryo from its inception, his chief publications being issued by his father's firm in 1849 and 1851. So widely recognized were these great treatises that he was awarded the honorary degree of Doctor of Philosophy and received appointments as full professor of botany, first at Heidelberg, later at Tübingen—unprecedented honors for a layman.

Higher plants are heterosporous: that is, the sporophyte generation shows a division of labor in producing two kinds of spores, megaspores and microspores. The megaspore develops into a plant that bears an egg, while the microspore forms a plant that bears a sperm cell; fertilization is accomplished by union of the two germ cells to make an embryo sporophyte, but recognition of the true nature of these two gametophytes was long delayed, since both are microscopic, develop within the sporophyte of the preceding generation, and do not at all appear to the general observer as plants.

The pollen grain is a microspore, four of which develop from each mother cell in the anthers of angiosperms. When transferred to the stigma, or receiving organ of the pistil, this microscopic plant germinates, sends a pollen tube down the style to the ovary, and the male generative nucleus, corresponding to a sperm nucleus in animals, descends this tube to unite with the egg cell nucleus in an ovule. Hofmeister's work eliminated the old distinction between cryptogams and phanerogams—the flowerless and the flowering—demonstrated a unified method of reproduction by alternation of generations, and made a panorama

Pollen grains of the dwarf iris resemble some lovely shell. Magnified 600 diameters.

of plant evolution a necessity, so paving the way for Darwin a few years later. Thus the pollen grain played its part in the development of modern botany and of that greatest of all generalizations of the human mind—organic evolution.

Meanwhile, Konrad Sprengel had, in 1812, published another series of important researches. He dealt with reproduction in plants and showed that cross-pollination is far more common than self-pollination; that in many plants the stamens and pistils ripen at different times as a device to prevent self-fertilization; and, most interesting and far reaching of all, stressed the part played by insects in cross-pollination and the remarkable adaptations of plants to attract insects and to produce and conserve nectar for their use. This work, also, was followed up by Charles Darwin.

Entomologists then began to discover that not only were flowers provided with colors, odors, sweet liquids, and special structural features to insure that insect visitors will carry pollen from one plant to another, as described by botanists, but also that the insects themselves were fitted out with adaptive modifications to facilitate this role. Finally it was seen that plants and insects, in many cases, have developed a form of symbiotic existence to a very high degree, and have thus evolved together, a change in one affecting the other. In this mutual adjustment, the pollen grain plays the central part, as important as a football in a football game.

Lastly, pollen study comprises a new and significant chapter in medicine, since, as is well known, these grains constituting foreign proteins, when inhaled and finding lodgement on the mucous membranes of the respiratory passages of persons who are allergic to them, set up an inflammatory condition out of all proportion to their size. The disease that results goes by the general name of hay fever, and it may indeed be so aggravated as to be accompanied by fever as well as asthma. It may cause intense annoyance or much suffering, and may necessitate expensive trips to pollen-free regions at certain seasons.

Pollen may be transported by three agencies—wind, water, and animal. Water pollination is uncommon and occurs only in submerged aquatic species; most water plants, as a matter of fact, employ the wind for the office of cross-pollination. Wind pollination is the rule in most trees and shrubs, many herbs with non-showy flowers, and nearly all sedges and grasses. Such plants must produce an enormous amount of pollen, since the finding of a stigma by a pollen grain occurs by chance, and these plants exhibit means of scattering the pollen as well as for capturing it. Long slender filaments and enlarged or protruding stigmas thus overshadow corollas in value, and the resulting flowers are more on the order of catkins or are very inconspicuous.

Hummingbirds, bats, snails, man, and still other animals transfer pollen in special cases, but by far the vast majority of animal pollinators are insects, and of these the order of incidence runs from bees through other hymenoptera to butterflies, moths, bee flies, and beetles, with sporadic occurrences in still other groups. The honeybee outranks all other insects in this capacity, with the bumblebee second. The amount of pollen produced is far less than for wind pollination as the transfer is so much more definite and certain.

In recent years the methods by which flowers attract insects, long understood in vague and general terms, have been studied experimentally. In the case of the honeybee, for example, it has been shown that the color and form of the flower are about four times more potent than odor, nectar, and pollen combined; also that blue was the preferred color and red the least attractive. It may be disconcerting to the fair sex, but science long ago reached the conclusion that flowers have gorgeous form, color, and odor for the attraction of insects, not debutantes.

Pollen grains designed for wind transportation have an entirely different problem than those made for insect carriage. Two of our illustrations will serve to bring out the main points: the pine pollen exhibits "wings"—planes would be a better term in these aeronautical days—while the hollyhock grain is spherical and covered with sharp spines that stick to anything touching them. In a highly microscopic manner, the requirements are similar to those for seed dispersal, concerning which we have already written. Maple or pine seeds have wings for wind transport, beggar's lice or stick-tights have spines to catch upon mammalian fur or human clothing.

The amount of variation in size, shape, sculpturing, and other features of pollen grains is enormous, and the specialist can identify the species of unknown samples of pollen in a large number of cases. The

References for the Microscopist

For the past several months we have suggested in this column a number of basic books as providing background for work with the microscope. With this issue we are taking the next step and listing our recommendations in six additional fields. In so far as the subjects interest you, buy one of these each month, or as often as you can. They make excellent gifts for others, or as suggestions for those who will wish to remember your birthday.

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interested reader is referred to a classic and comprehensive volume, *Pollen Grains,* by R. P. Wodehouse, McGraw-Hill, N. Y., 1935. A set of slides of various pollens can form a fascinating and important section of any microscopist's collections.

ADVANCED HINTS

Mounting Pollen Grains

Smear slides of pollen grains are not at all difficult to prepare, a little practice soon making one expert. Collect various pollens in separate, labeled, pill boxes or small vials, and store until dry so that individual grains rather than coherent masses may be mounted. Shake some of this fine dust on a slide containing several drops of xylene, this reagent serving to dissolve and remove the coating of oil that is generally present and that would interfere with staining and mounting.

Make an appliance known as a pledget by twisting a very small and flat and thin wisp of cotton around the pressed-together tips of a fine forceps, or around a seeker, needle, or toothpick, and with this wipe off the superfluous xylene with its contained extracted oil from the pollen. Repeat the treatment several times to get rid of all the oil. Take a small quantity of anilin oil and color it fairly deeply with any desired anilin stain, such as fast green or crystal violet, and add several drops to the slide, stirring it among the grains with a toothpick.

Heat over an alcohol lamp until the oil steams, but do not boil. Observe with a hand lens from time to time and keep up the steaming, adding more stained anilin oil when necessary, until the pollen appears well stained. Allow to cool, wipe off excess oil with another pledget, then treat with xylene again for two or three times, wiping off after each application, or drawing off excess with a bit of cotton or filter paper. This eliminates excess stain. Finally, while the preparation is still damp with xylene, add balsam and a cover glass.

NEW TECHNIQUES DIGEST CELL WALLS

In a news release from the United States Department of Agriculture, some interesting advances in cytological methods are described. S. L. Emsweller and Neil Stuart, of the Agricultural Research Administration, were looking for some method to render the thick cell walls of plants more transparent, hoping to make the contents of the cell, especially the chromosomes, more clearly visible. Trying first solvents and caustics to eat away a part of the cell wall, and meeting with little success, they turned to organic preparations and achieved their goal. An enzyme literally digests away a part of the cell wall and in some manner affects the internal structure, causing chromosomes to spread out. Microscope slides of such "digested" cells give clearer views of the chromosomes.

They have also had promising results with substances prepared from fungi—the same types that have been studied in wartime research on decay and destruction of fabrics, such as tents, clothing, and sandbags. Carefully controlled, the substances that break down the fibers of a sandbag can also be used to break down part—and only a part—of the wall of a plant cell. Early experiments have been mainly with pollen grains. Results with cells from roots have been less satisfactory, but other enzymes and digestive substances will be tested with roots in developing this new and promising tool for plant research.

EDWARD BAUSCH, 1854-1944

On July 30 of this year, Rochester, New York, lost its most distinguished citizen, and microscopical science one of its great pioneers. Edward Bausch, Chairman of the Board of the Bausch & Lomb Optical Company, died at his home in his ninetieth year, after a long life filled with great accomplishments. Dr. Bausch was a charter member of the American Association for the Advancement of Science and of the American Microscopical Society, sponsored the publication of the Journal of Applied Microscopy, and took out a large number of patents in various optical fields. A Cornell man, he received many degrees and honors, and was active in sports, banking, museums, and many other phases of civic life.

Dr. Bausch arranged the first football game between Cornell and Michigan, and went in for rowing. He designed and made the first Bausch & Lomb microscope, followed by many other instruments and accessories, of which perhaps the most famous was the iris diaphragm shutter for cameras, and the most important wartime aid the parabolic mirror for searchlights. Doubtless his most far-reaching achievement was his perfection of assembly-line methods for manufacturing microscopes in large quantities and at low cost, as we have recounted in these columns in a previous article.

In 1940 Dr. and Mrs. Bausch presented their home and grounds to the city to provide a new home for the Rochester Museum of Arts and Sciences, and built the first additional unit, Bausch Hall, now one of the main scientific attractions in a scientific city. Earlier, he had joined with other members of the Bausch and Lomb families in providing the Bausch & Lomb Physics Building on the campus of the University of Rochester. The city of his birth has been most fortunate in having two such distinguished manufacturers as George Eastman and Edward Bausch.

A.S.A.M. NEWS

Appearing early in September, Vol. II, No. 3, of the A.S.A.M. *Bulletin* set a new standard in makeup. Composition was done on a Variatyper, which permits horizontal letter-spacing in typewritten material so that the right as well as the left margins of columns are even, or, as the printer says, justified. A two-column page was thus possible and publisher Boyers M. Clark, Elkins, W. Va., has received many congratulations on the improved format.

Leading articles include a discussion of *Tissue Culture* and its many methods and reagents by Maurice Bogdonoff, West Hartford, Conn.; some searching comments on *Difficulties With Standard Techniques,* by Rodney M. Layton, Wilmington, Del.; the anatomy and the technique of mounting parts of *Spiders,* by Margaret Breitling, New Orleans; *Stained Blood Cells,* by Donald E. Payne, Palmer, Alaska; and several briefer articles on accessories and techniques. The cover was again contributed by the Rev. John W. Baechle, of Collegeville, Indiana.

Secretary Herman W. Fowler, 2729 Connecticut Ave., Pittsburgh 16, Pa., is now receiving dues for 1944-45, and, if the pot boils soon enough, another issue of the *Bulletin* is promised in much shorter time than in the recent past. Editor Corrington reports that he already has on hand a sufficient number of superior and interesting papers to enable printing of the best issue to date. Now if some member or patron will kindly discover oil on his land or make a new kind of better mousetrap, these literary contributions soon will see the light of day.

TRADE NOTES

The September issue of *The Scientific Monthly* is an unusually interesting one for the microscopist. The leading article is *Electron Microscopy,* by two of the men who are best qualified to deal with the subject, since both are pioneers in the research and development of electronics and its applications, especially to this famed instrument. Vladimir K. Zworykin and James Hillier are the authors, and collaborate in their work at the RCA Laboratories at Princeton.

Another article written by the man best qualified to deal with the subject, through years of pioneering in the field, is *Applied Microscopy of Hair,* by Leon A. Hausman, Professor of Zoology at the New Jersey College for Women, an affiliate of Rutgers University at New Brunswick, N. J. Both articles are abundantly illustrated and should be cut out and clipped, to add to your library. If you have not started a collection of papers of this sort as yet, now is a good time to begin.